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# AMERICAN GAS JOURNAL

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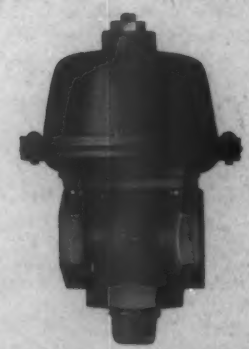

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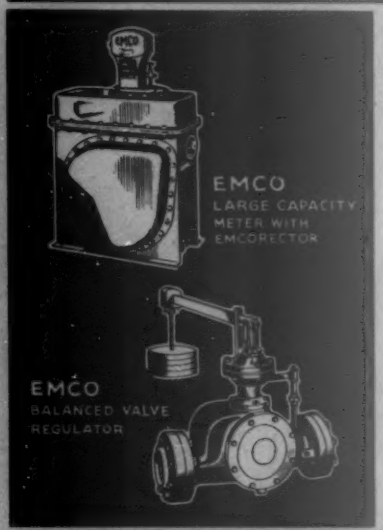


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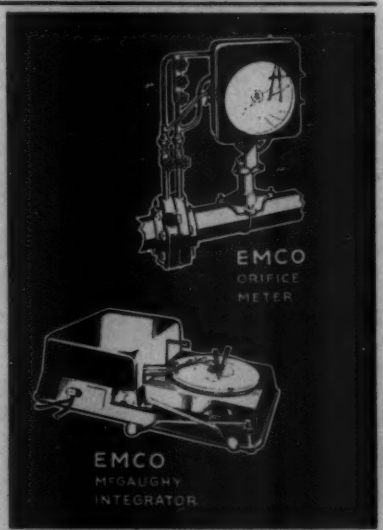


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# AMERICAN GAS JOURNAL

*Established 1859*

MAY 1935


## *Contents*


| | Page |
|---|---|
| As the Editor Sees It | 7 |
| Domestic Gas Utilization—Beginning of a Series of Articles for Gas Appliance Salesmen and Sales Engineers—Charles W. Merriam, Jr. | 11 |
| Gas Pressure Controls—Erick Larsen | 14 |
| Making the Service Application a Record of Importance—Part 2—H. J. Johnson | 17 |
| Gas Rate Design with Respect to Heat-Hour Comparisons with Electric Rates—Donald Henry | 21 |
| Economics of the Gas Industry—A. M. Beebee | 25 |
| Pressure Control and Extension Fittings for Pipe Lines—W. M. Henderson | 27 |
| Factors and Trends in Meter Maintenance—R. W. McClenahan | 30 |
| Service Regulator Testing—Allen D. MacLean | 33 |
| Natural Gas Men Meet at Memphis—Some Aspects of the Corrosion Problem in a City Plant—Charles F. Turner | 37 |
| Modern Advertising for Sales—George Ketchum | 41 |
| Safety Pilots—Their Design and Performance—J. A. Leighton | 43 |
| Play Up Gas Water Heating in Your Windows This Summer—Stuart Bratesman | 47 |
| Successful Selling: | |
| Employee Selling Increases Appliance Sales | 49 |
| Selling Hot Water by the Gallon | 50 |
| Oklahoma Natural Gas Co. Sponsors Automatic Water Heater Campaign | 51 |
| Safety Pilots and Relief Devices to Be Required on All A. G. A. Approved Gas Water Heaters | 51 |
| Comparative Advantages of the Modern Gas Range—George L. Scofield | 53 |
| New Direct Fired Gas Heating Installation—Chas. D. Greason | 56 |
| Equipment News | 57 |
| News of the Industry | 57 |



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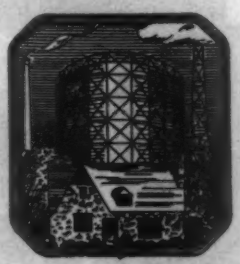

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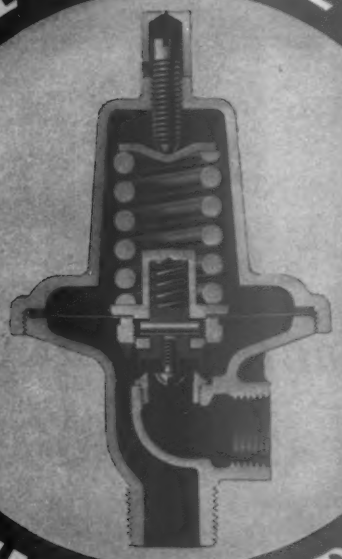

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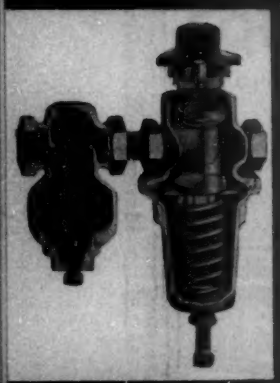

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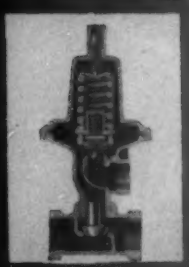

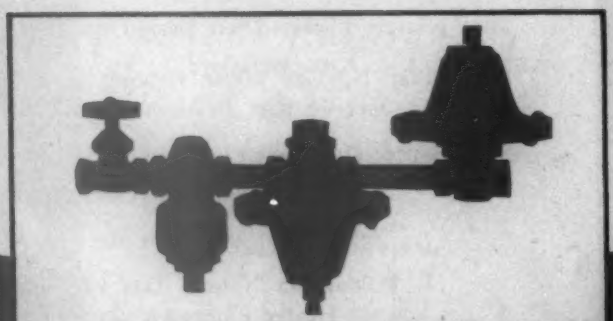

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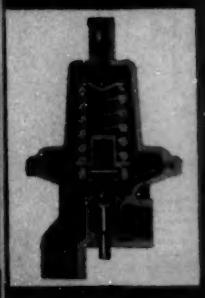

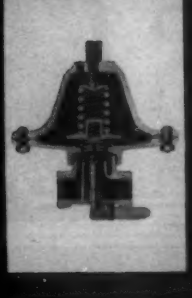

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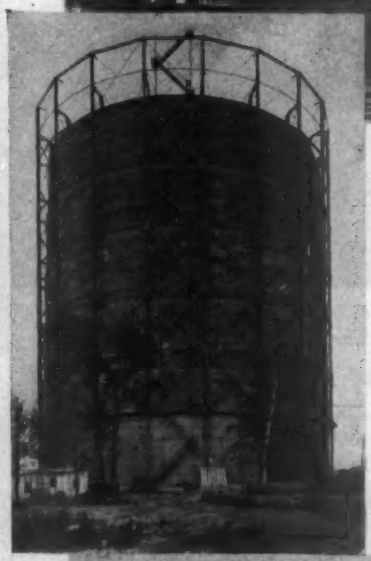

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*This pipe was laid in Germany during the reign of Frederick the Great*

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For further information, address The Cast Iron Pipe Research Association. Thomas F. Wolfe, Research Engineer, 1015 Peoples Gas Building, Chicago, Ill.

*Photo by courtesy Deutscher Gusrohr-Verband G. m. b. H., Cologne*

# CAST IRON PIPE

METHODS OF EVALUATING BIDS NOW IN USE BY ENGINEERS RATE THE USEFUL LIFE OF CAST IRON PIPE AT 100 YEARS

TRADEMARK REG.

# AS THE EDITOR SEES IT

**The "Heat-Hour"**

IN a paper appearing elsewhere in this issue of the JOURNAL, Mr. Donald Henry suggests the adoption of the "Heat-Hour" as the unit of gas measurement in our industry. A "Heat-Hour" he defines as 3415 B.t.u.,—virtually the thermal equivalent of the kilowatt-hour. Through the use of this new unit he seeks to secure a more direct comparison between gas and electric rates and thus gain an advantage in the ever increasing competition with the electric industry.

Mr. Henry's connections are for the most part with gas companies operating in places where the electric utility is controlled by other interests. Several of these properties are in TVA territory; others are in localities where electric competition is particularly keen. Mr. Henry is eminently qualified to speak on what we as an industry should do to meet present day competitive conditions.

A "Heat-Hour" rate, it will readily be seen, is really a thermal rate. The unit of measurement merely is 3415 B.t.u., the kilowatt-hour equivalent, instead of 100,000 B.t.u., the therm.

The idea is by no means new. In fact, it is almost as old as the therm itself. Several companies in Great Britain are reported actually to have adopted the "Heat-Hour" under the name of the "Small Therm." The subject was discussed in both the 1931 and 1932 reports of the American Gas Association Committee on Rate Structure. But thus far no gas company in this country has adopted a unit of measurement even approximately equivalent to the kilowatt-hour. This is no indication that such a unit might not be highly desirable. Our industry is conservative, and innovations are apt to be slow in gaining acceptance. Mr. Henry is in close touch with the firing line, and he is in a position to know what ammunition is needed. The fact that he has suggested nothing basically new, except perhaps a particularly good name for the proposed unit, detracts not the slightest from the value of his paper. We need more such information from men who can speak from intimate personal contact.

We, ourselves, a little further removed from the scene of competitive battle, are inclined to look at this whole matter from a broader viewpoint. What is to be our future unit of measurement for billing purposes? We have today schedules based (one) on thousand cubic feet, (two) on hundred cubic feet, (three) on therms, (four) on one-tenth therms, (five) on therms with an equivalent volume rate and, (six) on therms with an optional volume rate, usually though not always equivalent to the thermal rate. Now Mr. Henry urges that we adopt still another basis equal to about 1/29 therm. Each of these classes of units came into being in a perfectly logical way,—volume rates because the gas meter recorded volume and thermal rates generally because change or contemplated change from lower to higher heating value made desirable a revision in the basis of billing in order to avoid popular misunderstanding. The size of the units was determined by local considerations. The lack of uniformity is natural, but is hardly desirable as a permanency. Eventually we should have a unit of measurement which is simple, understandable and uniform and will aid us in selling our product. The present should be considered a necessary period of transition and readjustment.

Will there be a general adoption of thermal rates in the future or will the tendency be back toward volume rates? It is not our place to predict; nor are we by any means certain that the present, with the utilities being used as a political football, is a desirable time to make changes which may be misunderstood. However, it is a time when the industry may well determine what type and size of unit is best fitted to its needs and then constantly work toward standardization on it.

Thermal rates in this country have thus far been largely a by-product of the extension of natural gas lines to serve communities formerly supplied with manufactured gas. Except in scattered instances, such development is over for the time being at least. A reading of Mr. Beebe's paper appearing elsewhere in this issue does not encourage one to expect a further large expansion of our natural gas industry at any time in the future. Therefore it would seem that gas companies should henceforth consider thermal rates from the standpoint of their desirability in securing business and meeting competition; and if a unit of 3415 B.t.u. will get more business than the therm or the M cubic feet, as Mr. Henry believes, then we should consistently work toward its adoption.

The fact that our meters record volume is an obvious disadvantage in connection with a thermal rate. Cubic feet must be converted to therms (or fractions of therms) and the rate per therm then applied, a procedure which the average customer is unlikely to understand. Mr. Henry mentions the old ampere-hour meter. It is fair to ask whether if the electric industry had been unable to develop a watt-hour meter it would or would not still be selling current of a specified voltage at a given price per ampere-hour.

Also it is an undeniable fact that most electric appliances utilize heat energy more efficiently than do gas appliances. Therefore the "Heat-Hour" and the kilowatt-hour are comparable only from a potential energy standpoint; and this the electric salesman is unlikely to forget.

From a theoretical standpoint it seems to us that there is only one correct way to sell gas, and that is by the heat unit. Practical considerations and tradition on the other hand lend basis for valid argument for retention of the time honored cubic foot. It is not logical that part of the industry sell gas on one basis and part on another. Standardization must come eventually. Are we to hold to the old basis of selling so many thousand cubic feet of gas of given heating value for so much per thousand; or shall we endeavor to meet the disadvantages of the "Heat-Hour" or any other thermal rate and eventually standardize our charges on the basis of heat units delivered? It is timely and proper that the industry determine the most advantageous policy for its members to pursue.

**The Holding Company Bill**

THE Rayburn-Wheeler Bill still remains a menace to the utility industry. Hearings have been held and much valuable time and money spent in an effort to convince the Congressional Committees of the destructive character of the proposed legislation.

On April 5 the National Association of Railway and Utilities Commissioners urged almost a hundred changes in the bill, and argued that in its present form it would encroach on the rights of the States to control utility operating companies. In its opinion, only the relatively small "gap" of power moved interstate should be placed under Federal regulation. It argued that the holding companies should not be abolished unless "it should first be conclusively demonstrated that it is not possible to regulate" them.

Such representations should carry weight, but it is impossible to say what revisions, if any, will have been made when the bill emerges from the Committees. Popular interest in it has subsided temporarily, but the bill is far from dead. The utilities and their stockholders should not relax their efforts to convince their Senators and Representatives of the destructive and un-American character of this proposed legislation.

**Freedom of the Press**

WHEN the Federal Government gives out information for publication, that is "publicity." When the utilities give out information for publication, that is "propaganda." At least such would be our conclusion from a reading of the daily papers during recent months. But when material sent out by a Government Bureau for publication is not published, there may be an investigation. That much we know from experience.

Recently our offices were visited by an investigator for the Federal Trade Commission, who desired to know what sinister influence had prevented our publishing, in the dim distant part, an article having to do with the relative usefulness of gas of different heating values. Our files for that period had long since been consigned to the waste basket and our recollection of the matter is a bit hazy. As we remember it we were of the opinion that the paper was considered not worth printing. There was no sinister influence at work. Outside of questions of release for publication, copyrights, and other similar matters, normal and incidental to the publishing business, we can recall no instance where any gas company or trade association official or representative sought to influence what we did or did not print.

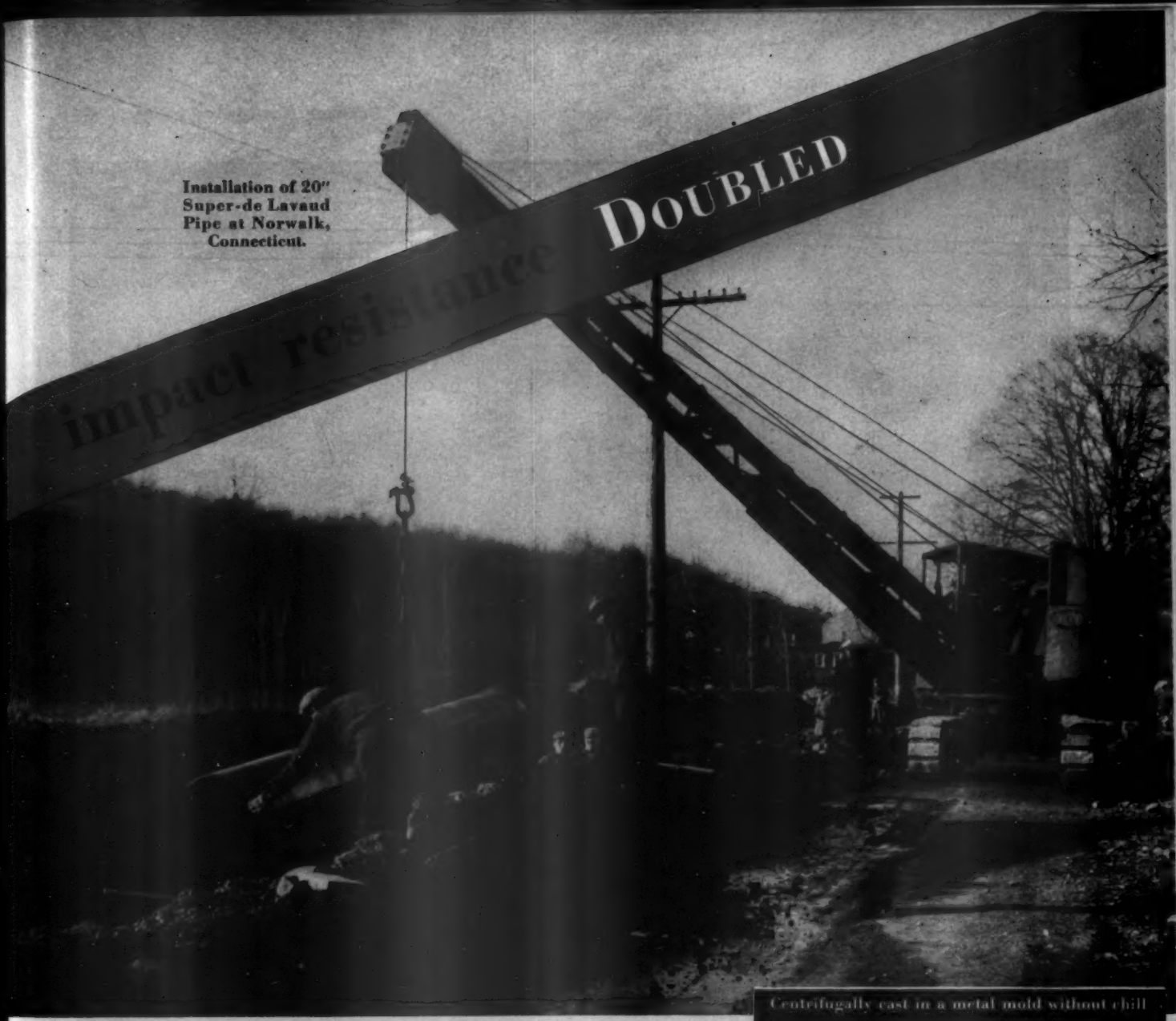
The JOURNAL is and always has been independent. It is published in the interests of the gas industry, and its policies are shaped by what its publishers believe best for that industry. It has no reason to fear investigation. But it does consider it a sorry situation when it is called upon to explain why a certain article was or was not published. Had it in all good faith invited an outside opinion, then our adviser apparently would have been guilty of sinister influence and ourselves of being merely a tool of the tainted interests.

In an address on April 25, before members of the Columbia University School of Journalism, Colonel Frank Knox, publisher of The Chicago Daily News, asserted that President Roosevelt should be held directly responsible for the attempts of his subordinates to limit freedom of the press. "Men like Tugwell and other brain-trusters," he explained later, "are trying to undermine the business side of a newspaper."

Just three days before Secretary Ickes had devoted a major part of his speech at the annual luncheon of the Associated Press to a denial that the government had any intention of interfering with the freedom of the press.

"For my part, I have always believed that the press should be absolutely free to express its opinion," he said. "Distorted or false facts should not be tolerated, but it does not matter much whether opinions expressed are justified by the facts or not. Freedom is not a matter of logic but of feeling and being. Any effort to circumscribe it would be dangerous. Any attempted legal restraint, however wisely applied, would be far worse than excesses of free expression, even though the freedom exercised bordered on license . . . Further on the subject of a free press, I want to say that in my opinion any fear that the government has any disposition to deny or even to abridge that freedom is without substance . . . . I wish that on this occasion I could say that those other equally precious rights guaranteed by the Federal Constitution, namely, the rights of free speech and of free assemblage, were on as firm a footing in this country as is the right of a free press."

We hope Mr. Ickes is right with respect to freedom of the press. We wonder under what classification he would place the publicity of the utility holding companies when threatened with destruction. Perhaps this belongs under "free speech," which Mr. Ickes fears is not "on as firm a footing in this country as the right of a free press." Certain it is that the utilities were subjected to criticism amounting almost to an apparent effort to intimidate when they sought to exercise their constitutional right to publicize the efforts of the government to wreck them.

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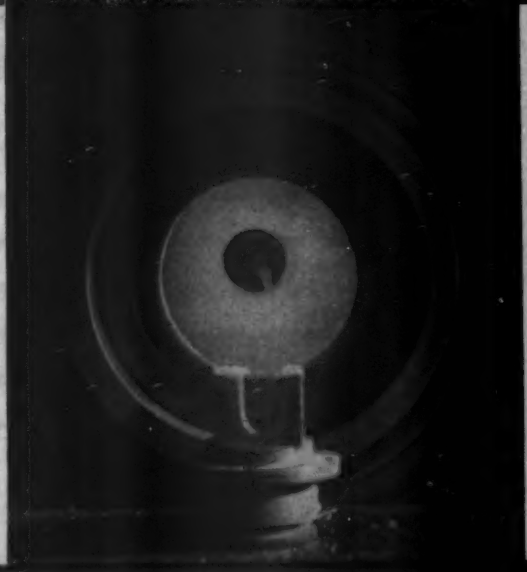

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184

AMERICAN GAS JOURNAL

MAY 1935

# Domestic Gas Utilization

## A series of articles which constitutes a handbook for gas appliance salesmen and sales engineers.

By

**Charles W. Merriam, Jr.**

Div. Commercial Manager, Consolidated Electric and Gas Co., Roanoke, Va

## INTRODUCTION

***This is the first of a series of fifteen articles by Mr. Merriam to appear in the JOURNAL. They will be of special interest to everyone who has to do with the sale of domestic gas appliances. They will tell the salesman the things he has to know about the particular appliance he is selling. They will tell him how to figure the capacity necessary to do a satisfactory job and will break down the appliances to show just how they function. In addition they will suggest selling campaigns and other material to help build the gas load.***

***Mr. Merriam graduated from the University of Michigan with a degree of B.S. of Mechanical Engineering. Practically all of his business career has been with the gas industry, covering engineering management and he is now the Division Commercial Manager of the Consolidated Gas & Electric Corporation with headquarters at Roanoke, Va. He is the author of several books on engineering and sales. His experience insures that this series of articles will be of great value to the gas industry in this day of greater and greater competition with other fuels. The series will cover water heaters, gas ranges, room heaters and refrigeration.***

### ENGINEERING ABC'S

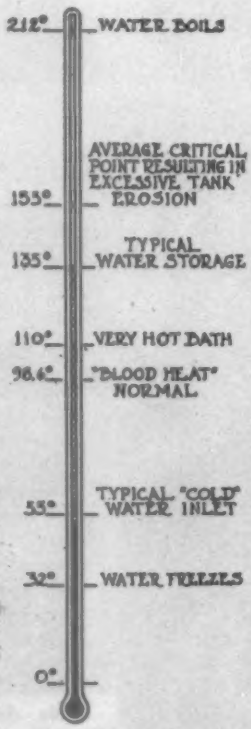
A WELL grounded and effective understanding of the use of gas in the home presupposes as indispensable at least a speaking acquaintance with a few fundamental engineering terms. That these technical phrases are quite straightforward and elementary will surprise some who have been needlessly awed by "high-faluting" professional men seemingly obsessed with the idea of casting an aura of mystery around what are really simple, basic facts. Now take it easy, relax—this is no story book—don't skim, read slowly.

First we must comprehend the difference between TEMPERATURE and HEAT. The former, or temperature, is descriptive of a condition of a body or substance. Temperature might be said to be a measure of the tendency of a body to transmit heat to or to withdraw heat from another body, it is a measure only of the intensity of the heat contained; then temperature describes the degree of hotness or coldness of a body. In general usage is the familiar Fahrenheit scale (abbreviated by F) of temperature according to which water boils at 212°F and freezes at 32°F. The scale between these two temperatures is divided for convenience on a thermometer into 212, 32 or 180 equal spaces commonly called degrees. One degree of temperature, 1°F is indicated by 1/180 part of the expansion of a mercury column which occurs when the temperature is raised from that of freezing water to that of boiling water. And then how about HEAT which is the primary concern of the gas industry?

If one pound (1 lb.) of water is raised in temperature through 1°F a certain quantity of heat is obviously required to perform this work. This quantity of heat might have been named most anything but some wise guys chose to dub this measure or unit of heat a Brit-

ish Thermal Unit, whence the common handle, Btu. Thus it can be observed that whereas TEMPERATURE is a quality, HEAT is a quantity. And heat has not been exactly defined yet, but that unfortunately involves a lot of academic theory about molecular activity* that is only remotely associated with most practical domestic gas applications. The important thing is that now you know that if water is raised from a 65° inlet to 135° storage temperature (135—65=70°), it requires the absorption of 70 Btu. for each 1 lb. of water so raised; or for 50 lb. of water through a similar temperature rise, 50 times 70=3,500 Btu.; or conversely if 5 lb. of water are allowed to cool through a 15°F. drop then 75 Btu. are transferred to the air or surrounding material. Heat will always flow naturally or be transmitted from a hotter to a colder body thus equalizing temperatures if sufficient time is allowed. Now, that's simple, isn't it?

In the gas business we are accustomed to think and speak of water in terms of gallons. Well, one gallon weighs 8⅓ lb., from which it is apparent that the absorption of 8.33 Btu. is required to raise 1 gallon through 1°F. in temperature. Remember this oft used constant—8.33 Btu. per gal. degree temperature change is very elemental.




At this point it might be well to discuss what the engineers label the LATENT HEAT OF VAPORIZATION, which is not actually as difficult as it sounds. We have defined water as boiling at 212°F. under ordinary conditions. In order to change its form or state, that is from water to steam, an extra 970.4 Btu. are required per lb. without any change in temperature occurring. Why it takes 970.4 Btu. of heat no one can satisfactorily explain, except that it is a proven fact that Nature cut the cards that way. This has a lot to do with the gas business. Consider what we call tea pot, or kettle water heating on top of a stove—the average housewife for some obscure reason wants steam issuing from the kettle before using—think what this means. To raise 1 lb. of water from 65°F. to 135°F. or 70° requires, as shown, about 70 Btu., but to raise 1 lb. of water from 65°F. to steam at 212°F requires (212—65) plus 970.4=147 plus 970.4=1117.4 Btu.—nearly 16 times as much heat! So this vaporization business is quite important. Each kind of liquid has a definite boiling point and heat of vaporization.

Of lesser importance is another term styled LATENT HEAT OF FUSION which involves the heat absorbed from the atmosphere in melting ice (a solid) into water (a liquid) at constant temperature; or vice versa, the heat that must be taken away from water to make ice. This latent heat of fusion for water is 144 Btu. per lb. Other substances have different melting points and heats of fusion. The important point to observe is that basically heat is an inseparable part of the refrigeration process.*

Another basic conception, a rough understanding of which is fundamental to our subject, is that "Work," "Energy," "Heat" and "Power" are all interchangeable, or are one and the same thing expressed in a different way, or are interconvertible, or as the engineers say, have a common denominator. Work is the application of a force (push, pull, lift) through some distance, as for instance lifting 10 lb. up 5 ft., the result being called 50 foot-pounds of work. Power is often measured in terms of horse-power, which is simply doing work at the rate of 550 ft.-lb. each second. A horse-power on the other hand is the same basic thing only in another form, as heat applied at the rate of 2,545 Btu. per hr. which, in turn, is the same as 746 watts. Heat and Energy are frequently termed "stored work." So it goes round and round.

To us it is significant to note that 1,000 watts are equal to 1 Kw., containing 3,415 Btu. which if divided by 525 equals 6.5 cu. ft. of 525 Btu. gas or 3.4 cu. ft. of 1,000 Btu. gas. Note that this refers to potential thermal content, which is not necessarily the heat usefully employed. In actual practice this "equivalent gas" varies, but is about 8.8 cu. ft. of manufactured gas, due to inherent differences in thermal efficiencies discussed later on. By the same token the heat stored in coal, wood or oil is subject to variable conditions of efficiency in the process of utilization. The true worth of any fuel from a competitive standpoint resolves itself into the cost not of the *potential* but rather of the *used* heat, or in other words the cost of accomplishing work. Better read these two paragraphs over again—there's a lot of meat.

How is this so-called "stored work" or heat obtained or released from common fuels such as coal, oil or gas? The general process of heat release or burning is called COMBUSTION, which, in truth, is nothing but a chemical change known as rapid oxidation, or the rapid combining of oxygen with the combustible elements of the fuel employed. For instance, 1 cu. ft. of methane (one of the principal ingredients of manufactured and natural gas) if combined chemically through burning with 2 cu. ft. of oxygen, will produce or release a gross heat of 1,023 Btu. previously stored in the fuel. In practice the oxygen for combustion is supplied by the air, which is made up roughly of one part of oxygen and four parts of nitrogen, the latter not entering into the chemical changes involved in burning is referred to frequently as a dilutant or an inert. Then to secure the necessary 2 cu. ft. of oxygen for the combustion of 1 cu. ft. of methane gas requires roughly, 10 cu. ft. of air. With the common forms of manufactured gas now

* The Kinetic Theory of Heat assumes that molecules, which make up all substances and matter of every kind, are in constant motion or vibration. Molecules which are the tiniest particles of all the materials of which the world is formed, such as water, air, steel and wood, are the very smallest imaginable bits of matter, and those of each separate sort of material are mutually attracted to one another by a cohesive force similar to magnetism. The imagination is taxed to comprehend that molecules even in dense matter are separated by space or a void that relative to the size of the molecule is large. Molecules are supposed to be perfectly elastic, bouncing from one to the other at a fixed speed without ever tiring out, the speed continuing at the same pace until energy is either added or subtracted in the form of heat. The speed at which molecules of any given material travel is a measure of the energy or heat content and consequently of the temperature—the greater the heat the more rapid the motion and hence the tendency of materials to expand or contract in volume under temperature changes.

* Another obscure phenomenon of nature concerns the three forms or state of being of all substances, i.e., solid, liquid and gaseous. Definition is superfluous except to observe that 1. a solid maintains a fixed shape unless subjected to high heat or some pulling or pressing force, 2. liquid assumes by the force of gravity the shape of its container, and 3. gaseous is literally a state imposing no bounds. Heats of vaporization and of fusion mark the change or transition point respectively between a gas and a liquid and between liquid and a solid. The Kinetic or Molecular Theory holds that these two mile-posts, vaporization and fusion, are critical stages, or sort of "busting" points, in the activity of the molecules. Each successive change in physical state represents a "main division point" in the attractive force of molecules each to each. To bring about a change in form or molecular arrangement is accomplished by a heat (which is energy) application, all of which proceeds without temperature fluctuation in the material itself.

* For an advanced study reference is made to "Combustion"—Industrial Gas series, Am. Gas. Assoc. or "Fuels and Their Combustion" by Haslam and Russell, McGraw-Hill Book Co.

distributed, which is made up of a mixture of several gases, the proper amount of oxygen to support combustion is obtained with from 4.5 to 6.5 cu. ft. of air per cu. ft. of manufactured gas or roughly twice this proportion for natural gas. Every gas has a definite oxygen (or air) requirement depending upon the chemical elements composing the gas.*

Admitting air in amount greater than that required for complete combustion is called supplying "excess air," or air that does not enter into the process of chemical change releasing the available stored heat in the gas burned. The extent to which excess air is admitted, for instance, to the combustion chamber of a water heater, has an important bearing upon the performance of the same and for the following reason—consider, a heater having a stack or exit temperature of 250° that the difference between this and the water temperature represents an unrecoverable quantity of heat. Further consider that the volume (as well as the temperature) of the products of combustion escaping up the flue also influences the extent of the heat loss, from which it is apparent that any air over and above just that necessary in affording the oxygen requisite for complete combustion is the cause of an unnecessarily increased volume of flue gases, hence of a source of added loss. It is likewise apparent that air not needed to support the chemical process of combustion will have a tendency to dilute or reduce the temperature of the flame. The control of "excess air" is one of the principal problems in the efficient combustion of gas. However, the lack of adequate air will produce a condition of incomplete combustion which in addition to introducing elements of danger, chiefly carbon monoxide gas, might seriously reduce efficient utilization. Better read that one over, too.

### Thermal Efficiency

The term, THERMAL EFFICIENCY, with respect to a water heater, as an example, merely means the relation or ratio of the heat (Btu.) actually absorbed in or delivered in the water to that of the heat (Btu.) supplied by the gas. Engineers dignify the situation by talking about the Third Law of Thermodynamics—whew, that sounds awful—but it merely means that energy (see Work, Heat and Power above) can be neither created nor destroyed, which, in our language, can be stated that the gas (heat) put into a water heater goes for one of two ends; namely: 1. Heating up the water (termed useful work), or 2. Heat wasted by either going up the stack or by radiation, etc., through the walls of the heater into the cellar. In other words, the heat usefully employed plus the heat wasted must equal the heat (or gas in this case) supplied—an extremely simple fact that is often overlooked even by the self-styled experts. It is logical to conclude then that the greater the thermal efficiency the less the operating cost, hence the greater the customer satisfaction.

Each material has a distinctive ability to conduct heat—thus a solid copper rod heated at one end conducts or transmits heat within itself so that soon the opposite end becomes hot (the material being said to have high "THERMAL CONDUCTIVITY"), whereas putting a wooden handle on the latter end prevents scorching one's hand (hence wood is said to have a high "THERMAL RESISTANCE," the reverse of "conductivity"). Witnesseth, steel has a thermal conductivity of 26.1 compared to that of 0.042 for asbestos fibre, therefore, in order to keep heat inside a water tank or a bake oven the walls are wrapped with asbestos or some similar insulating material. The loss of heat from a storage tank (or a hot water pipe) is dependent, among other things, on the area of the surface, the temperature of the water inside and of the air on the outside. More about this later.

Changes in temperature cause materials to expand or contract in bulk, the extent of which changes in size depend upon the temperature differential and also the characteristic of the particular material. This property is measured scientifically by what is termed the CO-EFFICIENT OF LINEAL EXPANSION—thus, in each 1 in. of original length for each 1°F. increase (or decrease) in temperature copper expands (or contracts) 0.000,009,3 and hard steel 0.000,005,6. The fact that dissimilar metals expand to a different length is the principle employed in some thermostats and safety shut-off gas valves described later on. By the same token materials expand (or contract) cubically as well as lineally. For instance, 1 cu. ft. of water at 62°F. weighs 62.356 lb., whereas at 212°F. the weight is 59.76 lb., an expansion of bulk involving a lessening of weight per cu. ft. (or density). This lightening of a substance is what causes water to rise to the top of the tank on heating. This same principle is the explanation of air circulation in a room—thus, at 60°F., 100 cu. ft. of air weighs 7.656 lb. and at 200°F. weighs 6.026 lb. in consequence of which air heated by a radiator is made lighter, hence rising to the ceiling. This process is one of the factors involved in the rising of the products of combustion up the flue of a water heater. Likewise cold air falls downward from the "Chiliator" of a refrigerator.

Just one more of these basic engineering principles, and that has to do with SPECIFIC HEAT. It has been stated that 1 lb. of water absorbs 1 Btu. to raise 1°F. in temperature. Thus water is said to have a specific heat of 1, inasmuch as specific heat is the number of Btu. that must be imparted to or subtracted from a substance to change the temperature 1°F. Other substances require a different amount of heat per lb. to increase the temperature 1°F. as can be seen from the following:

| | | | |
|---|---|---|---|
| Aluminum | 0.218 | Iron | 0.110 |
| Asbestos | 0.200 | Tin | 0.056 |
| Air (13 cu. ft.) | 0.237 | Steel | 0.120 |
| Copper | 0.092 | Water | 1.000 |

From a water heater point of view the importance is this: 1 ft. of ¾" steel pipe weighs 1.12 lb. and contains 0.2339 lb. of water. To raise the pipe and water 1°F. means that (1.12 × 0.110) plus (0.2339 × 1) = 0.3571 Btu. per ft. of length. Therefore, if a ¾" hot water line cools from 130° to 70°F., the loss per lineal foot is 0.3571 (130—07=21.4 Btu).

Much more might be said concerning the foregoing engineering (particularly by those with more rabid technical inclinations) but these bare fundamentals are at least prerequisite to the thorough understanding, and hence, to the sale of modern gas appliances. If this article stimulates you to a more inquiring and exacting inquiry it will have performed a noble purpose. Make this simple background knowledge a tool in your sales equipment and thoughts—grasp it so completely as to become sort of second nature to you and from this will arise that rampant self-confidence essential to successful selling. In the next article of this series we will examine into the various types of gas water heaters available on the present market.

*(Continued in June Issue)*

# Gas Pressure Controls

## TYPES OF CONTROL

By
Erick Larson
Gas Engineer

CHECK valves are semi-automatic controls designed to allow flow in but one direction, that direction being from the source of supply to the load. In gas practice the most common type of check valve is one with the flap at an angle of approximately 45 degrees to the horizontal. The advantages of having the flap at an angle rather than horizontal is the lower differential pressure required to open the flap and the effectiveness of part of the weight of the flap in closing the check valve at periods of no gas flow. With the flap horizontal its entire weight would be effective in closing the check valve, but the full weight of the flap plus adhesion between valve disc and orifice seat must be overcome and the valve maintained in an open position by the loss of gas pressure. Furthermore, with a horizontal flap and orifice seat there would be more likelihood of foreign matter remaining on the valve disc. Vertical flaps have not been used. In this type an arm is usually provided for a hinge to hold the flap to the body of the check valve so as to secure flexibility and allow it some freedom of movement. With a vertical flap the tendency would be for the flap to drop and be eccentric to the orifice seat.

Ordinarily check valves give no external indication of their operation. However, for gas distribution an improvement has been the extension of one end of the flap hinge through the body and the addition of a lever arm which partly counter-balances the weight of the flap and the friction of the stuffing box but is not sufficiently heavy to cause the check valve to remain in an open position. If desired, the external lever arm and weight may be reversed so as to require additional power or loss of pressure to open the check valve. The purpose of this is to assure a tight shut off, thus minimizing the possibility of by-passing. Reversing the arm is desirable at storage controls.

The external check valve lever arm provides a means of manually assisting the check valve to open or close, if temporarily necessary, and also to check the freedom of operation of the valve. The valve discs may be of leather, composition or metal, depending on the same circumstances as would dictate the selection of materials for the valve discs of regulators. Check valves are usually used in conjunction with regulators although occasionally as the sole type of control. They are the simplest form of control.

Shut off valves electrically operated or clock, pressure or manually actuated are sometimes used to control the flow of gas. The disadvantage of these is that pressures will vary, since their only purpose is to allow gas to flow during certain periods. The dependability of electric service is an important factor. Pressure actuated electrical controls are preferable in most circumstances as adjustments would allow gas to flow only when the source of supply was above a predetermined pressure. A combination of time and pressure may be used so that the valve would open during peak load periods regardless of pressure conditions or, if the transmission system is the weak factor, pressure would be the primary control allowing no flow unless the inlet pressure exceeded a predetermined minimum. There are but few electrically controlled valve installations compared to the number of line regulators as the same functions may be more easily performed by the latter.

For the control of pressure from pounds inlet to pounds outlet, pressure line regulators are the most common type of control. A line regulator consists of a valve of either the single or balanced type, opened and closed by a diaphragm which acts either directly on the valve stem or indirectly through a lever action from a so-called auxiliary bowl, a combination of both or a toggle linkage connecting the valve stem to the valves. The line regulator ordinarily allows gas to flow in but one direction, but by the use of two auxiliary bowls or complicated levers attached to the diaphragm a regulated reverse flow may be secured.

Vacuum controls have occasional use in high pressure gas distribution at such locations as compressors and storage tanks. Vacuum regulators are similar to diaphragm operated line regulators except that operation is dependent upon a predetermined vacuum instead of a positive pressure. A simple form of vacuum regulator has a diaphragm which acts upon a dog rather than directly on a valve. The dog maintains a shut off valve in a closed position until released by the diaphragm. Once the dog is released and the shut off valve opened it re-

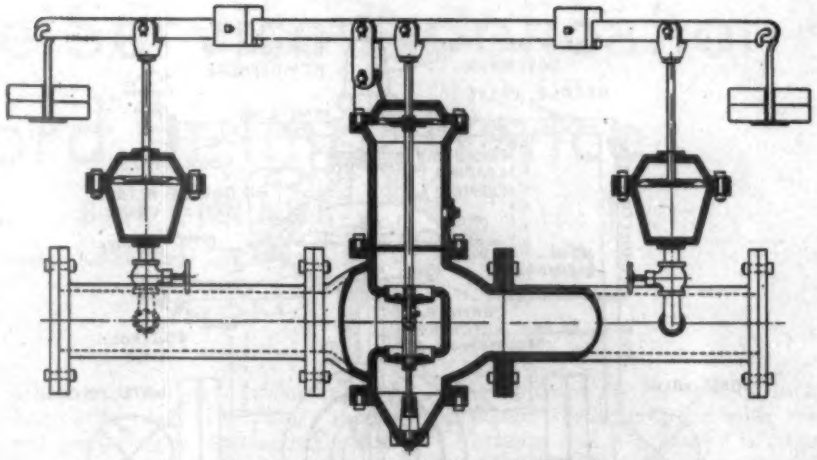
Check Valve With External Arm

mains open until manually closed. This regulator is automatic only in opening the shut off valve.

Gas seals are safety devices designed to release a confined pressure or vacuum when a predetermined pressure or vacuum is exceeded. There are two types of seals, mechanical and liquid. The mechanical type has a valve which opens when a predetermined differential pressure across the seal valve has been exceeded. In this type the dead weight of the valve, which may or may not be augmented by a spring, is the only force counter-balancing the differential pressure. The valve facing is usually thin leather, reinforced with a fluid or viscous substance which will present a soft surface against the orifice seat. Such seals are used only in the lower ranges of pressure where five pounds or less are encountered. A regular appliance regulator has sometimes been used as a relief valve by modifying the body to allow for extra weights or the addition of a spring. Such a relief device is practically another regulator. Types with seats have the same difficulties as an encountered in line regulators, i.e., the maintenance of a permanently complete seal.

The liquid type prevents escape of gas from the confined section into the atmosphere or any provided container by a head or column of the liquid. Should the pressure of the gas exceed the opposing column of liquid the liquid would be forced out of its container and follow the same path provided for the escaping gas, or may be caught in another suitable container. The liquid used may be water, oil, mercury or any other desirable fluid. When a vacuum is being controlled the liquid would be drawn into the container allowing gas or air also to be drawn into the container.

A pilot operated line regulator has the diaphragm chamber sealed from the valve chamber or outlet lines. Operation of the diaphragm is produced by changes in the pressure maintained between two auxiliary or pilot governors connected in series from inlet to outlet of the main regulator. The chamber above the diaphragm is connected to the atmosphere as in a simple line regulator.



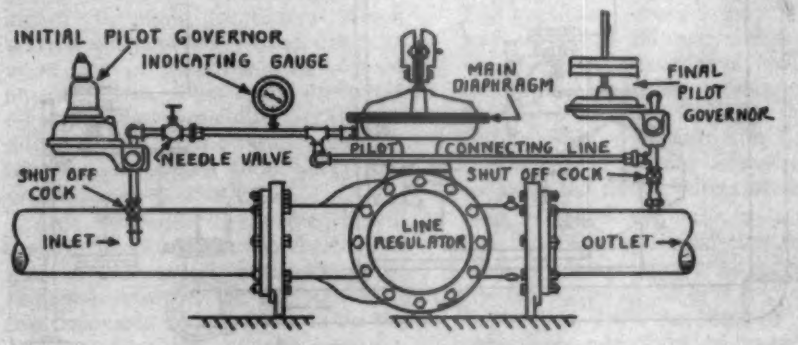
Reverse Flow Control or Differential Regulator

Pilot operated line regulators, while not as common as pilot operated district governors supplying low pressure systems, have been used for special purposes such as on extremely small distribution systems where an absolute shut off is essential. Pilot governors provide more sensitive regulation and more available power for shutting off the line regulator because the pressure actuating the diaphragm exceeds the lock up pressure. When the line regulator is locked up no flow of gas occurs through the pilot governors. Should the pressure on the outlet drop below the lock up pressure, the final pilot governor opens first causing the pressure in the pilot connecting line to drop. This in turn results in the initial pilot governor valve opening. The flow of gas through the pilot governors would be sufficient to sustain a very small load on the distribution system; but should the load decrease, the pressure between the needle valve and the final pilot governor will drop, and the diaphragm on the line regulater will move downward. The function of the needle valve is to increase the rapidity of the pressure drop under the line regulator diaphragm after the final pilot governor has opened as the needle valve is an additional restriction in the pilot connecting line.

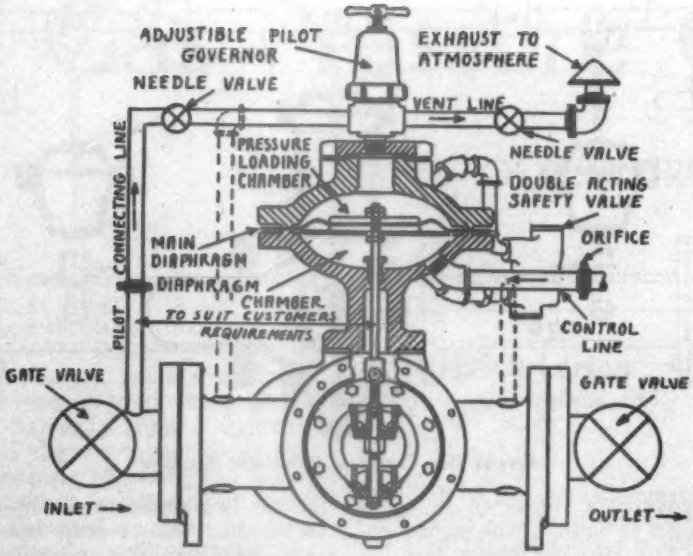
Pilot or pressure loaded line regulators are those having a pressure on both sides of the line regulator diaphragm and, therefore, dependent upon the differential of pressure across the diaphragm for operation of the valve. Usually the counter-balancing force is a dead weight or spring, but in a pressure-controlled regulator pressure alone is the actuating and counter-balancing force. A high degree of sensitivity may be secured with pressure loading.

The diaphragm chamber of a pressure loaded regulator is connected to the outlet either immediately at the regulator or to the control point, which latter method would be termed remote control. Remote control is particularly valuable on any type of line regulator when the distribution mains form a loop with both ends near the control station as then the remote control line may be piped to the end of the loop. Such a system is more common on low than on high pressure distribution lines. An orifice or needle valve is installed in the control line to produce a slight time lag in outlet pressure changes affecting the actuating pressure so as to prevent hunting or vibration of the diaphragm.

The pilot connecting line is connected to the inlet. A needle valve, orifice or both are usually installed for the same purpose as on the control line. A small capacity pilot governor is installed, receiving its supply from the pilot connecting line and controlling the pressure in the pressure loading chamber. Movement of the diaphragm changes the pressure in the pressure loading chamber. This difficulty is provided for by a vent or exhaust line containing a needle valve, which is adjusted to




Pilot Operated Line Regulator




Pressure Loaded Line Regulator

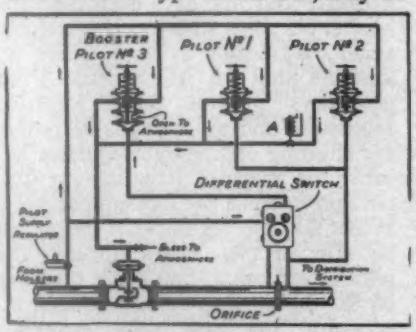
allow a flow of approximately ten feet per hour. The small flow of gas compensates for pressure changes in the loading chamber and allows the pilot governor to maintain a uniform pressure at its outlet.

In contrast with the usual differential of from outlet to atmospheric pressures across the diaphragm of a common line regulator, the pressure or pilot loaded regulator has only a slight momentary differential of pressure across the diaphragm. This allows for the use of larger more sensitive and flexible diaphragms from which the advantages of sensitive control are secured. To protect these sensitive diaphragms against a harmful differential of pressure a double acting safety valve is connected across the diaphragm. This allows a flow in either direction should the differential pressure exceed that predetermined as the safe limit for the particular diaphragm.

Other terms for pilot control or loading such as sensitizers, auxiliary controls and various trade names have been used. All of these devices seek to make the operation of the valve more responsive to pressure changes on the outlet or controlled side of the regulator. Pilot loading will provide a control within plus or minus one per cent of the outlet pressure as compared with ten per cent on ordinary regulation.

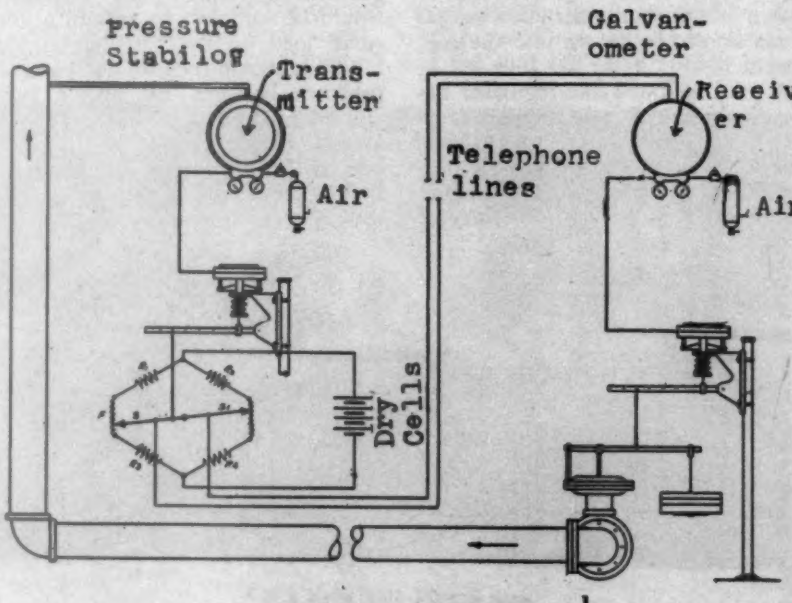
Pilot booster combinations are arrangements of pilot regulators which cause an actual increase in the outlet pressure after a certain predetermined decrease in that pressure has occurred. This increase is secured by having three or more auxiliary governors, the opening of the third or more of which increases the pressure in the pressure loading chamber, thus increasing the opening of the valve and increasing the outlet pressure.

Telemetric gauges, while not in themselves a type of control, may be




Pilot Booster Combination Possible on Pressure Loaded Regulators

used as the actuating mechanism for several of the usual types of controls.




Electrical Transmission of Pressures

Telemetric gauges are electric devices whereby (1) the pressure at a particular point is impressed upon a transmitter which (2) changes the pressure into an electrical impulse which (3) is transmitted by wire to a receiver where (4) the impulses are changed to visible indications corresponding to the pressures impressed upon the transmitter or may be used to actuate control equipment. Recording in place of indicating gauges at the receiver end are preferable since they result in a visible indication of the pressure trends at the transmitting end. Often as a temporary or permanent check of received pressures, recording gauges are installed temporarily or permanently at the transmitting end. The design of telemetric gauges is usually such that should there be any electrical or mechanical failure at the transmitting or receiving ends the gauges would read zero. Accuracy of the pressure indication at the receiver should be an essential requisite. Where accuracy is essential a telemetric gauge should be designed so that a small change in pressure at the transmitting end will result in impulses at the receiver. Some gauges require as high as one-half pound differential at the transmitter to cause impulses on the receiver. This may be satisfactory where very high pressures are transmitted, but would not be satisfactory in the lower ranges used on distribution systems. Provisions are usually made at the receiver whereby the proper functioning of the transmitter may be checked.

Telemetric gauges have been installed to record pressures originat-

*(Continued on page 74)*

# Making the Service Application A Record of Importance

By H. J. JOHNSON

Manager Utility Dept., Remington-Rand, Inc.

PART II

## Taking Applications

WHENEVER an application for service is received reference is made to the Customer History Record, either by direct reference or by means of Inter-Departmental telephone communication facilities. This reference is made in connection with both telephone and personal applications, while the customer is in the office or on the telephone. If the applicant has not previously had service, a new Customer History Card is filled out showing business or occupation, business address or employer, name of husband or wife, references if any, nature of property owned if any, and whether or not the premises for which service is being ordered are owned or rented. The application is then signed by the applicant, after which the name is printed for verification of spelling. The full first name of the applicant should always be secured in order that future identification may be made positive. Initials, only, are very unsatisfactory for identification purposes. If the applicant does not personally sign the application, the full name and relationship of the signer should be shown. The relationship would indicate whether it was a son, daughter, wife, landlord, or agent. This is very important in order that identification of the person actually making the application may be positive.

If the record shows that the applicant has previously had service, it is only necessary to verify the spelling of the name, location at which service was previously used, business or occupation, and business address or employer. This will positively eliminate any possibility of future difficulty in connection with the transfer of unpaid final bills from one location to another.

This reference to the record will also definitely disclose whether or not a deposit or guarantor should be required, whether or not an existing deposit is adequate based on the present condition of the account, whether or not all previous final bills have been paid or whether the present guarantor is satisfactory.

This procedure should also be followed in connection with any request for extension of time on a past due bill, or in determining what collection effort should be made.

The procedure as outlined, in addition to providing all the advantages described also makes it possible to handle three applications in the time ordinarily required to handle one. The complete record of all these facts develops confidence on the part of all employees who come in contact with the customer and it consequently makes them better representatives of the company. It insures the proper promotion and cultivation of satisfactory public relations because all of the contacts are based on a full knowledge of the real conditions.

The following form of contract illustrates the typical terminology that is used. This may, of course, be varied to meet local conditions.

### Contract for Service

The applicant whose signature appears on the reverse side hereof, hereby makes application to the (Blank Public Utility Company), for gas and/or—electric service to be supplied on the premises described below and at such subsequent location as the applicant may use service. The applicant agrees to pay for such service as bills are rendered therefor, in accordance with the rates, rules and regulations filed with and approved by the Public Service Commission of this State, or as may hereafter be amended and in effect at the time of delivery.

It is also understood that the Company may require as security for payment of bills a cash deposit of such amount, as it may deem adequate for its protection and the increase of such deposit in accordance with the amount of increase in the monthly bills. The deposit will be returned upon discontinuance of service, provided any or all bills shall have been paid. The Company may at its discretion refund the deposit, prior to the discontinuance of service. Interest will be paid in accordance with the regulations on file with and authorized by the Public Service Commission of this State, or as may hereafter be amended and in effect at the time of delivery.

## Method of Recording Information

The method of recording the following information as outlined is based on a composite method covering the procedure in use by a number of companies and is subject to such variations and modifications as may be found necessary to meet local conditions.

## Record of Collection Effort and Experience

A complete record of all collection effort and experience is posted in order that future collection effort may be handled on a selective basis which will make it possible to concentrate the effort on the particular accounts where it is needed and eliminate the necessity of wasting any time or effort on those accounts that do not require it. This results in a reduction of both collection expense and bad debt losses.

Space has been provided for posting this information by months for a period of ten years with the delinquent amounts distinguished as between service and merchandise.

Two squares have been provided under each month. The amount of service delinquency is entered in the space to the left and the amount of merchandise delinquency in the

space to the right. The amount of delinquency is expressed in dollars only, cents being omitted.

If it becomes necessary to discontinue service for non-payment of bill, a circle is placed around the delinquent amount involved. The recording of the amounts as outlined provides a graphic record of the number and frequency of final notices and shows clearly whether the unpaid balances are increasing or decreasing.

Space is also provided for the posting of such items as N.S.F. checks, unearned discounts allowed, and bypassing of service. This is done by means of symbols, (O) (/), in the spaces provided for the various months.

### Deposit Ledger

Space has been provided on the card for the complete ledger record of all security deposits. This eliminates the deposit ledger record being maintained at the present time. All deposits received, refunded, or applied to liquidate final bills, are posted to this record and the balance extended. Space is provided in the visible margin to show the amount of the deposit, in pencil, in order to make it possible to balance with the General Ledger control without even turning the pockets. It is recommended that a separate control be maintained for each letter of the alphabet. On large installations this may be further sub-divided by Soundex Codes under each letter, if so desired. Space is also provided for showing the date, amount, and period covered by all deposit interest payments. A balanced deposit record on the Customer History Record Card eliminates any duplication, insures absolute accuracy, and provides full information covering security deposits for each individual customer without the necessity of a second reference. The balancing operation on this record requires substantially less time than with the usual form of record.

### Final Bill Procedure and Inactive Account Ledger Record

Final bills are issued in the regular manner and the ledger record filed by account number for the location at which service was furnished. If a moving or forwarding address was given by the customer, this is noted on the ledger record and as each section of accounts is being balanced on the regular cycle basis, all final bills that still remain unpaid are transferred directly to the new account or, if no new account has been established, transfer is made directly to the Inactive Ledger Record section on the Customer History Record card. If a new service location is shown on the Customer History Record card, transfer is made to this location. The amount is shown in the visible margin of the card which makes it possible to balance with the general ledger control with a minimum of effort. A separate control should be maintained for each letter of the alphabet except in the case of letters with relatively few accounts such as X, Y and Z which may be grouped. Daily totals of transfers and payments are posted to the corresponding control card daily and the new control balance extended.

### Checking Deposits and Final Bills

Having the record of both deposits and final bills on the same card eliminates any possibility of refunding a deposit if the final bill remains unpaid, or charging off the final bill if a deposit is being carried. Actual installations have in practically every instance disclosed the fact that a large number of deposits which appeared on the record as "unclaimed" were due customers for whom final bills had been charged off. Consequently by the restoration of the final bill and the application of the unclaimed deposit it was possible to reduce the liabilities with a corresponding increase in revenue and earnings.

### Bad Debt Ledger

The inactive ledger section of the card provides a column to show the date that the unpaid final bill is actually charged off. These cards remain in the file indefinitely and are indicatetd with a red signal. The result is that if the customer ever returns and applies for service any amount which has been charged off may be collected by virtue of the fact that the record is checked on every customer contact. All bad debt accounts may be balanced with a ledger control if so desired in order to insure the proper accounting for any amounts which may be collected.

### Guarantor's Agreement

The practice of accepting guarantors in lieu of cash deposits is generally very unsatisfactory. If it is necessary to continue this practice it is important that proper control be established in order to provide the necessary protection to the company and to guard against any adverse effect on public relations.

The applicant must definitely designate the proposed guarantor, so that reference may be made to his personal account in order to determine whether it has been sufficiently satisfactory to justify his being accepted as a guarantor. As soon as the guarantor's agreement has been signed it is filed in the back of the pocket containing the Customer History Record card for the customer whose account is being guaranteed. This makes it possible to notify the guarantor concerning the delinquent condition of the current account or the fact that a final bill still remains unpaid and that unless payment is received within a specified time the amount will be transferred to the guarantor's personal account.

If a new guarantor is taken for a subsequent location, it is only necessary to replace the original card

with the new guarantor's agreement.

### Record of Accounts Guaranteed

It is very important that a record be maintained of the accounts guaranteed by any one individual guarantor. A card is provided for filing in the back of the pocket, with the guarantor's history card, on which is recorded the names and addresses of all accounts guaranteed, together with the date opened, date closed, any unpaid balances, and the manner in which these balances were disposed of.

Whenever a guarantor closes his account, all of the customers whose accounts have been guaranteed by this individual will be notified to either make a cash deposit or furnish a new guarantor. It often occurs that the guarantor's personal account develops into a more unsatisfactory condition than the accounts guaranteed. In this event all of the customers whose names and addresses appear on this card will be notified to make cash deposits or furnish new guarantors.

This provides a complete cross reference between accounts guaranteed and the names of guarantors, together with a positive control of the activity.

### Reduction in Bad Debt Losses

Bad debt losses may be substantially reduced: first, through making it possible to make all necessary arrangements with the customer at the time of taking the application, with regard to getting a new deposit, an increase in an existing deposit, a satisfactory guarantor, or the payment of previous unpaid final bills; second, due to the fact that the proper collection effort can be made while the account is current; and third, through the ability to definitely identify a customer if he returns for service at another location. This is actually accomplished while in contact with the customer.

It has been definitely established that many items are being written that could either be transferred to the customer's account at a new location or liquidated by the application of deposits. On several installations the total of such items identified, transferred and subsequently collected, and including those liquidated by the application of unclaimed deposits, has amounted to an average of from twenty to fifty cents per active account.

### Record of Merchandise Sales

All merchandise sales over and above an amount to be determined on, are posted to this record by showing the date, terms, item, and amount. When final payment has been made on a contract, the date of payment is entered in the space provided for it. If, for any reason, the appliance must be repossessed, the date of repossession is entered in the proper column. The elapsed time between the date of the contract and the date of final payment indicates whether or not the customer conformed with the original terms. Such information is very valuable when approving future contracts.

### Authorizing Special Credits

There are some instances when for reasons of policy it becomes necessary for a company executive to authorize credit without adhering to the regular standards and requirements. The fact that these instances have not been properly recorded has tended to break down and shift responsibility and has often been used as the basis for alibis and complaints that the number and frequency of these occurrences made it impossible to operate the credit and collection activities on a sound basis. These cases should be properly recorded on the Customer History Record and thus definitely fix the authority for every action and prevent a shifting of responsibility.

### Authorizing Merchandise Credits

Merchandise credits are authorized as the order is taken by direct reference to the record. This covers sales made by the salesmen in customer's home, in the branch offices or in the main office. Salesman's time may be conserved and embarrassing customer contacts avoided by checking a customer's credit before the sale is made.

### Inactive Cards

All inactive cards are indicated with a signal over the months' scale in the visible margin, to show the month in which the account was closed. Each month all cards that have been inactive for one year are removed and placed in a transfer file, provided the final bills have been paid and the deposit refunded. No search of the transfer file is made unless the applicant claims to have been a previous customer. Experience proves that the majority of customers who ever return, do so within one year. All cards with unpaid final bills, charged off accounts, or unclaimed deposits remain in the file indefinitely.

### Verifying Remittances

All remittances that are received without the cashier's stub being attached are checked with this record to secure the proper address and account number of the account to which the remittance should be credited. Experience on actual installations has proved that not more than fifteen minutes' time is required for this operation which formerly required several hours. Through showing name of husband or wife in the visible margin it becomes possible to identify checks drawn on the personal account of one or the other when this differs from the name in which the account is carried.

### Duplicate Bill Procedure

The use of the Customer History Record together with the recommended duplicate bill procedure makes it possible to both speed up the duplicate bill procedure and reduce the clerical effort usually required for this operation more than 50%.

All requests for duplicate bills should be received at the regular Customer Service and Application desks or counter. The name and address as given by the customer are entered on the duplicate bill form and the account number is secured by reference to the Customer History Record Card either through direct reference or by the use of the proper Inter-Departmental telephone communication facilities. A telephone contact is then made with the Bookkeeping Department to secure the amount. The time required for preparing duplicate bills is less than one half of that required under the ordinary system. This not only improves the service to the customer but effects a corresponding reduction in the clerical cost of this operation.

### Location of the Record and Inter-Departmental Telephone Communication

The record may be located where the customer service contacts are made and applications taken so as to permit the clerk who waits on the customer to make personal reference to the record. Or it may be located anywhere in the building by providing the necessary telephone communication facilities. The record should be divided into units with one clerk entirely responsible for the ac-

tivity on each individual unit. This responsibility covers not only the posting to the record, the balancing of the deposit ledger and inactive ledger but also all reference and credit authorization work. Each unit should be provided with the proper telephone instrument in order that direct connection may be made with the proper clerk and thus insure the best and fastest possible service to the customer as well as the elimination of all confusion.

### Importance of Proper Installation

The success of any system depends upon its proper installation and use regardless of how well it may have been designed or how efficient the equipment may be.

The installation must include a complete search of the present records, the correction of all discrepancies in names, addresses and account numbers and the accumulation, verification, organization, and transfer of all essential information from every available source. In addition to this, it should include the training of the record clerks in every operating feature of the system.

A substantial reduction in the clerical cost of installing the record can be made by the proper organization of procedure, establishing adequate standards of production, elimination of confusion and maintaining a smooth flow of work in connection with all of the various operations.

### Personnel Necessary to Operate the Record

Under ordinary operating conditions one clerk can make all references, authorizations and handle all of the clerical work on an installation of 30,000 active cards. This estimate is very conservative because on some installations one clerk is handling 50% more accounts than this. On this basis a very substantial clerical economy can be effected as compared with the cost of maintaining the several files and records which are combined in or eliminated by the Customer History Record.

If the record is located where the customer contacts are handled and the clerk waits on the customer as well as making the references and postings to the record, the number of accounts is reduced to approximately 20,000. If this record is located away from the point of customer contact the customer contact personnel will be reduced from 35 to 50% due to the fact that the taking of applications and the handling of customer requests for information will require considerably less time. On installations up to 20,000 accounts it is more economical to locate the record at the point of customer contact whereas on larger installations the cost would be approximately the same wherever located.

### Fundamental Principle of Operation

The successful operation and use of the record as outlined is absolutely dependent on one fundamental principle:

> "The speed of reference and the ability to secure information that is both accurate and complete while in contact with the customer either in person or by telephone."

Every consideration covering the design of the forms, the location and operation of the record, method of filing, and the housing equipment to be used must be based on this principle. Attempts have been made to vary the prescribed method but in every instance it has been necessary to finally adopt the procedure as described in this outline.

The opinion has existed and numerous attempts have been made to operate with a partial or negative record. A record covering customers with unpaid final bills, with whom special collection effort has been necessary, or where any of the company-customer relations have been unsatisfactory but in no instance has this been found satisfactory. Actual experience has disclosed the fact that the operating cost is practically equal to that of the complete record. This is due to the fact that all service orders must be checked through it to determine whether there is a card in the file. After the search has been made or the card located very little additional time is required for the actual posting. The clerks, knowing that there may not be a card in the file, often make a superficial search with the result that many changes are never posted and consequently the record is inaccurate. In addition to this, a partial record cannot possibly eliminate the various auxiliary files and records and the clerical operating expense necessary to maintain them. It is just as important to use a record which shows favorable information covering good customers as to have a record which shows unfavorable information concerning poor customers because from a public relations standpoint it is more important to avoid questioning the record of a good customer than to extend any unwarranted privileges to a poor customer. It is of the utmost importance that the record show the trend of experience with each individual customer regardless of whether it is becoming increasingly favorable or unfavorable.

Many efforts have been made to use alphabetic filing but this has in every instance been changed to phonetic filing because the wide variation in the spelling of the majority of names resulted in a tremendous number of filing errors caused by transposition of vowels, errors in spelling and illegible writing. The result of this was that the finding of the proper record was very slow and in addition to this many were entirely overlooked.

In many instances vertical filing has been tried but in no instance was it possible to secure the speed of reference which would permit checking a customer's record while in contact with the customer in person or by telephone. In addition to this clerical operating expense was too high. With vertical filing it is also impossible to include the deposit ledger or the inactive ledger because the balancing of the records becomes very difficult unless the amounts are shown in the visible margin because it would be necessary to scrutinize each individual card, whereas by showing the balance in the visible margin this operation requires considerably less time than with the usual form of ledger record.

Vertical filing also makes it practically impossible to keep the file clear of inactive cards. Inactive cards must remain in the file for one year before being removed. This is automatically controlled in visible filing by the use of signals placed over the month scale to show the exact month of disconnection. Cards showing the amount due remain in the file indefinitely.

### Summary of Operating Advantages and Economies

The installation of a customer History Record, based on actual experience will effect the following operating advantages and economies:

1. Complete record of all past experience with each individual customer will result in better and quicker service, thus assuring the preservation and development of the best possible public relations. Clerical effort will be reduced to a minimum by combining on one card all of the information now maintained in several places.
2. Soundex will eliminate the possibility of duplication and confusion of one account with

*(Continued on page 72)*

# Gas Rate Design with Respect to Heat-Hour Comparison with Electric Rates

By

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HEAT is the gas utilities' only tangible commodity — the only tangible thing we have for sale. Our heat is like no other heat in the world. It is packed in concentrated form readily usable and convertible, and always cleanly to use. Yes, we deliver it just where you want it, in any quantity, at any time. That is the celebrated "service" we give. You say, we also sell "service." No! We *give* the service but we *sell* the heat. The customer's monthly bill depends upon the heat he uses—not on the amount of service we give him with the heat. Heat ought to be an easy thing to sell—everybody uses it for any number of purposes. We shouldn't have any trouble in selling it—lots of it—to most anybody. But we do have difficulties and at times we just simply can't sell our heat. Sometimes we are outsold even by our electric brethren when we know our heat is as hot as theirs, can do just as many things, is just as convenient and cleanly and besides is a whole lot cheaper. Yet some of our customers, who should know better, go off and buy electric stoves! Why do you suppose we can't sell our good, convenient heat at a time like that? Maybe it's because we haven't been selling heat—just simple heat—what the customer wants and must buy. Perhaps we've been selling a lot of cubic feet, conversion ratios, heating value standards and what-nots. What do you suppose would happen if we started out to sell just simply heat?

### Sell Heat—Not Cu. Ft.

From its earliest days the gas company seems to have been selling —not heat—but cubic feet! And what can I, as a customer, do with a cubic foot—or a hundred of them—or a thousand for that matter? Well, I wouldn't know and you couldn't tell me either without a whole page of figures. The trouble is that the cubic foot has no direct relation to the value of your heat to me as a customer. The early choice of the cubic foot as a measure of gas service probably was no fault of those early gas company operators who were responsible for its adoption. In their day nobody worried greatly about how much heat was in a cubic foot of gas—they were selling a luxury and neither cost nor the unit of measurement made much difference. Price competition was not a factor—only convenience and the prestige of having gas when one's less fortunate neighbors could not. Well, all that is changed now—no longer do we sell a luxury but a necessity, and the first question is, "How much does it cost?" And our venerable and hoary-haired friend the cubic foot cannot answer. He says, "I'll call in my engineers and they will give you the answer next week." We need to put a fellow on the job who can give you the answer now, directly and automatically, so simple a child can understand it—not next week buried in a page of figures.

In early days the electric industry used as its measure of service for billing purposes the ampere-hour. This unit was not an accurate measure of the energy furnished, this industry too was selling a luxury and who cares how it's measured or what it costs, when you buy a luxury? Even the application of the ampere-hour was complicated and inaccurate. The meter reader carried a pair of scales with which he weighed a pair of electrodes suspended in an electrolyte. By determining the gain in weight of one electrode, and the loss in weight of the other since the last "reading" of the "meter," he could calculate the ampere-hours used since the last reading. Imagine the meter reader of today proceeding in this way!

It didn't take our electrical friends long to learn that they must get down to brass tacks. They were selling energy—energy in competition with many other time-tried sources and their unit of measurement must measure energy. This, the ampere-hour did not—especially after the advent of alternating current. Therefore, the ampere-hour was superseded by the kilowatt-hour. The kilowatt-hour accurately measures energy, either direct or atlernating current, and energy is what the customer is buying. The electric customer doesn't have to know at the end of the month what the voltage standard is, all he asks is, "How much actual energy did I use?" and his bill tells him directly —without calculations and without experts with figures. Of course, the electric company must maintain its voltage, frequency, etc., to the standards of good operating practice but when this is done, the customer is entirely unconscious of the existence of these other necessities of good service.

For certain purposes, the electrical industry still uses the ampere-hour but you couldn't find an ordinary domestic customer who ever even heard of it, or knows what it is. No one in the electrical industry would advocate returning to it as a unit of measurement of ordinary service. Ask your neighbor if he wouldn't like to go back to it and he'd say, "Ampere-hour, what's that? No, a kilowatt-hour is good enough for me. I know what that is." But does he? About the only thing he really knows about it is that it is something for the use of which the electric company charges him 6c or 8c each at the end of the month, that this billing is based on the reading of a meter hung up in his house which the electric company assures him measures kilowatt-hours and so measures the value of the service he receives.

Likewise, the gas customer believes he knows, "What is a cubic foot of gas?" But does he? Here

probably he would be further from the fact than in the case of the kilowatt-hour. He does know what is a cubic foot, but a cubic foot of gas may be anything or nothing in its value to him. Measured in terms of its usefulness to the customer, the value of a cubic foot of gas changes each time its heat content is changed. Even a trained engineer cannot tell you its value unless you first tell him its heat content.

When the customer buys gas he doesn't buy an unchanging chemical element. He buys a mixture of various gases, some of which are combustible and some of which may not be. Even the combustible ones give off different amounts of heat per unit of volume when burned. When these gases are combined in different proportions, the result is a different heating value for each different mixture. What the customer actually uses is the amount of heat given off by the combustion of the inflammable gases in our mixture. Therefore, to know its value to him the customer must know how many heat units will be given off by the burning of one of our cubic feet—in other words, a standard heating value must be established.

State Commissions do not fix the voltage standard of each individual electric company nor even a state-wide standard. They merely say, "You adopt the standard which best fits the conditions of your territory and customers but when you have adopted it, do not vary from it more than five percent." The Commission knows that the kilowatt-hour automatically compensates for differences in voltage standards of different electric companies and that, the measurement being in kilowatt-hours, each customer receives exactly the energy he pays for regardless of different voltage standards.

We gas men know that with different combinations of gas making equipment in each gas plant, and with different costs of various raw materials in each locality, there is one certain heating value of gas which may be manufactured in each plant, more cheaply and with more uniformity than any other. But we are not free to seek and adopt this "natural" heating value. The State Commission in order to stabilize and simplify comparisons prescribes a state-wide standard based upon average conditions. It then stretches out or squeezes up your plant to fit its measure regardless of the fact that you might do a better job for the customer, and do it cheaper, if you could adopt some different measure.

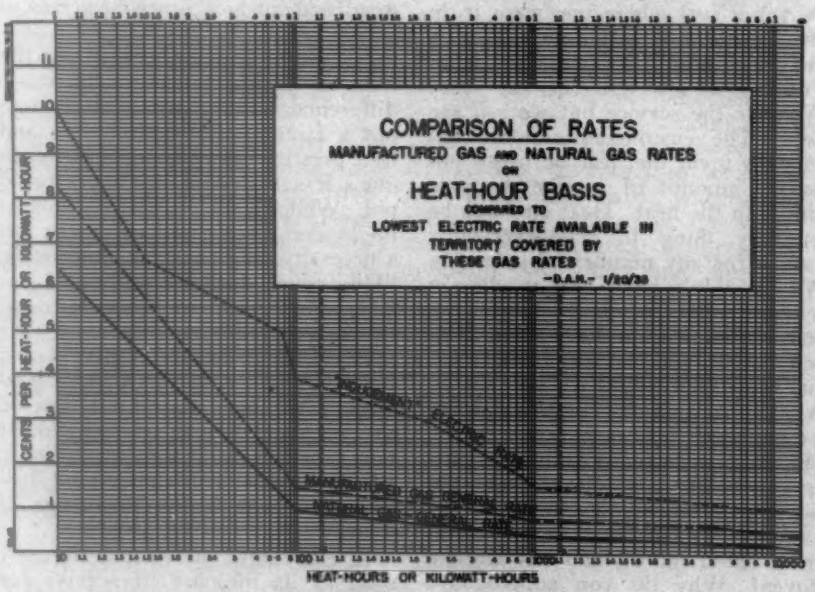
### Relative Values

Heated arguments break out between the customers, the companies, and the commissions, over the relative value of this or that heating standard when all the time the customer's chief interest should be in the *maintenance* of the heating value without variation. If we were actually selling gas in heat units, as we should be, and not in cubic feet, maybe we could get the customer to focus his attention on the things which affect the quality of his service, and leave to us the selection of the standard heating value.

With the adoption of rates based upon energy consumption, the electric companies removed from the realm of controversy all such things as voltage standards. With the adoption of rates based upon heat consumption, the gas companies likewise could remove from controversy heating value standards, and other things not concerned with the value of the service to the customer. The customer and commission could concentrate their attention upon assuring themselves that the standard is being maintained.

With this thought in mind, numerous gas companies in this country and Europe have adopted as a unit of gas service value—the therm. This is defined as 100,000 British thermal units of heat. As we know, a British Thermal Unit or B.t.u. is the quantity of heat necessary to raise the temperature of one pound of water one degree Fahrenheit. Eureka! Here is a heat unit rate—just what we've been looking for—let us adopt the therm. Fine! But we've solved only part of the problem. One hundred thousand of anything is too much for most of us—except possibly for Congress to measure dollars given to the President. It's too large—too awe-inspiring for the customer to grasp its practical meaning. For most of us to comprehend the value of anything we must have it in such terms that we can compare it with something else. When I was a small boy, I measured dollars in terms of ice cream sodas (and it was twenty to the dollar then, not seven or ten). If my mother said, "I will give you 35c to do this," I had to divide "35 ÷ 5 = 7—Seven ice cream sodas—is that enough?" Had she said, "I'll give you seven ice cream sodas," my decision would have been instant and automatic. So with the customer—he wants to compare our values with something else he knows about. This he cannot do with either cubic feet or therms.

Our salesman drops in to sell Mrs.




Housewife a gas range, or a water heater, or a refrigerator. She looks at his pictures and listens to his sales talk but sooner or later she says, "What will it cost me to operate this appliance?" He says, "Madam, our gas rate is $1.25 per 1,000 cu. ft." "Yes," she says, "but the electric man was here this morning to sell me an electric range and he sells kilowatt-hours at 2½c each—$1.25 seems an awfully high price compared to 2½c." What do we do then? We launch into a long talk about heat value, how many kilowatt-hours it takes to equal our thousand cubic feet, etc. At the end of it Mrs. Housewife is thoroughly bewildered but not convinced.

### Consumer Psychology

We talk among ourselves long and loudly about "customer psychology,"

but what do we do about it? We enamel our stoves in pretty colors, we put on heat controls, we make our valves look like switches or radio dials, we do all sorts of things but we do not meet squarely that question, "What will it cost to operate compared to other appliances I am offered?" A kilowatt-hour costs 2½c, a thousand cubic feet cost $1.25. Some companies improve the psychology by saying a hundred cubic feet cost 12½c. Some companies go to therms—a therm costs 23c. None of these units compare in size—much less in cost—with the kilowatt-hour with which it is most frequently compared and with which the customer is familiar. What we need is a common denominator.

A kilowatt-hour if used in substitution of any of the services rendered by the gas company yields 3,412 plus British thermal units. We cannot force the electric companies to change this unit. Why should they? The psychology now is all in their favor. But if the mountain will not come to Mahomet, there is really no reason, except pride, why Mahomet may not go to the mountain. Without a means of forcing the electric companies to come to us, we must go to them.

Even the most ethical electrical salesman hardly would fail to take advantage of the confusion in the customer's mind due to the present diversity of units of measurement and the apparently favorable, to him, price comparison. Is it any wonder that there is a fairly widespread belief that for cooking, water heating and refrigeration, electricity is as cheap as or cheaper than gas? We know this is erroneous but we must prove it to the customer. We have found that it cannot be done by pages of figures, constant reiteration or pretty pictures. These things make the customer at least impatient if not suspicious.

We need to take just one simple step to put ourselves where the psychology of the situation will be completely reversed in our favor. Suppose we adopt a unit of 3,415 b.t.u. —slightly larger than a kilowatt-hour. We now measure our service in heat units without reference to extraneous characteristics which affect in no way the value of the service. We have our unit in small enough therms for popular understanding and we tell the customer we are selling him a unit almost identical with a kilowatt-hour at a fraction of its cost.

Such a new unit, however, will require a new name. It should have a name suggestive of its parent—it is the child of the gas industry. It should have a name suggestive of measurement. It ought to be a name with a popular appeal, easy to say, easy to remember, fluent and above all a name which cannot be confused with any other term now in use.

### Heat Hours

The gas industry's slogan is HEAT, heat for *any* purpose, heat for *every* purpose—"If you can do it with heat, you can do it better with gas." *Hours,* is associated in the public mind with a measurement, time elapsed during which we do something or something is done for us. Why then not call our new unit, consisting of 3,415 b.t.u., a HEAT-HOUR. True, the term heat-hour does not mean anything until defined—we do not want it to —we define it as 3,415 b.t.u.— slightly larger than a kilowatt-hour. This is one of its chief advantages— it sounds like it meant something but it cannot be confused with any other unit of measurement. It suggests gas service for any use to which heat may be applied. It is simple, euphonious, fool proof and rolls off the tongue as easily as a first class cuss-word.

Armed with HEAT-HOURS, the gas appliance salesman has nothing to fear from electric competition. No longer need he fumble or evade that question, "What will it cost?" Now he says to Mrs. Housewife, "I am here to tell you about an appliance which will do your work better than any appliance offered to you. It will use 300 heat-hours per month. A heat-hour is practically the same but slightly larger than a kilowatt-hour with which you are familiar. Heat-hours cost 7c each while kilowatt-hours cost 2.5c each. Make the comparison yourself, it does not depend upon any calculation which you may not understand. You do not have to depend upon me or any other salesman. You can know before you buy what my gas appliance will cost to operate as well as the comparative cost of operation of any other appliance offered to you to perform the same service."

"If you do not care to make the comparison yourself, I can demonstrate it visually for you." He brings out the little device attached hereto. "Mrs. Housewife, what is your present average monthly electric bill?" "About $2.00 a month."

"The broken line on this large sheet represents your monthly bill for electricity, mounting higher and higher as you use more and more kilowatt-hours. The number of kilowatt-hours is shown along the lower edge, and the dollars of monthly bill is shown along the left-hand edge. For your present average bill of $2.00, you can get approximately 35 kilowatt-hours. If you use 100 kilowatt-hours, your bill will be $4.00; for 200, $6.00—and so on regardless of the use to which you put these kilowatt-hours."

"The upper edge of this small moveable piece represents your gas bill. If you use the number of heat-hours shown along the lower edge for any purpose your gas bill will be indicated along the right-hand edge opposite the point on the upper edge immediately over this number of heat-hours."

"I place the point marked 'A'— which is for zero heat-hours—at the point on the broken line on the large sheet representing 35 kilowatt-hours and $2.00 monthly bill; and with the movable section horizontal. The new appliance we are considering will use 300 heat-hours. I find the point representing 300 heat-hours on the movable section and follow this vertical line up to the upper edge of the loose section. At this point I follow the horizontal line on the large sheet, over to the left-hand edge and I find your combined electric and gas bill will be $3.75— my appliance has cost you an additional $1.75 per month to use."

"If you are considering an electric appliance to do the same work and want to know what your total electric bill will be, you have only to follow this vertical line up to the broken line on the large sheet and again follow the horizontal line from this point to the left-hand edge and we find your total bill—all electric—will be $6.45; or the electric appliance to do this work will cost you $4.45 monthly to operate."

"But," says Mrs. Housewife, "The electrical salesman was here this morning and he said your appliance was not as efficient as his; it takes more heat-hours than his did kilowatt-hours to do the same work."

"Of course a part of my heat goes up the vent, and this helps to cool your kitchen and carry off odors of cooking, but my appliance operates cheaper than his because of the much lower cost of heat-hours than kilowatt-hours.

"If you examine this movable section, you will see that this factor of efficiency is already taken care of in its construction. You will see that 150 heat-hours is taken as equal to 100 kilowatt-hours and 1500 heat-hours to 1000 kilowatt-hours. This gives the electric appliance credit for 50% greater efficiency than gas, and still after adding the cost of

50% more heat-hours than kilowatt-hours to your present electric bill—which we have done—I show you the great saving we have just found over the cost of the electric appliance."

It easily will be seen that this device can be constructed to give accurate results for any desired assumption of relative efficiency, or a separate movable section can be made up based upon the individual relative efficiency of each separate appliance. It also can be used to indicate incremental costs for any desired combination of gas and electric bills and appliances, if the customer now uses both services.

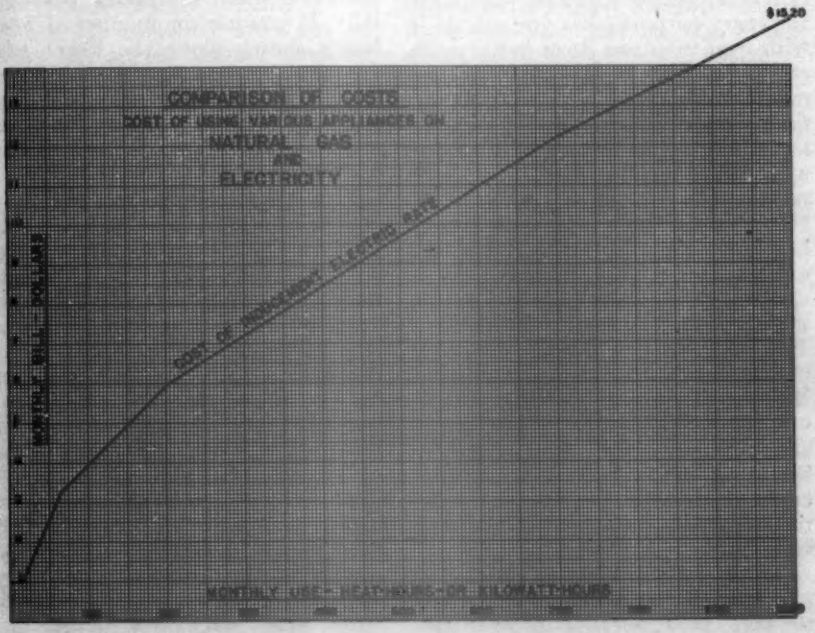
One of the electric salesman's prize arguments has been the combining all service on electricity and getting only one bill gives a lower total charge than taking part on electricity and part on gas. Usually this is not true but in the past it has taken reams of figures to prove it. With the heat-hour, and this handy little device, its truth or falsity can be proved in each individual case—and that by the salesman without making a figure and before the eyes of the customer. Comparative costs are no nightmare for the salesman with heat-hours to sell and this device to help him.

Some people say we have a monopoly but they are not in the gas business. If they were, they would soon recognize that our companies are in active daily, hourly competition with the electric companies and all other methods of furnishing heat. We must adopt for our own salvation every legitimate advantage there may be in the situation. It must be admitted that whatever makes comparisons of competing agents easier and more understandable for the customer not only clarifies the competitive field but promotes good feeling between the customer and the company and builds up the confidence of the public in the company and the public regulatory bodies or state commissions. With the edge on competitors from the price standpoint, our gas companies have nothing to fear from such comparisons. Rather, we should welcome them and promote them. This will be the certain result of the adoption of the heat-hour, on account of its simplicity, its flexibility and its innate logic.

But perhaps we'd better see if the heat-hour gives us what we want. What we need is:

1. A unit which directly measures the true value of the service to the customer.
   The HEAT-HOUR does that.
2. A unit which measures service value in quantities which the mind of the ordinary customer may deal with and comprehend.
   The HEAT-HOUR does that.
3. A unit which renders direct comparison of the cost of operation of gas and electric appliances easy and practically automatic.
   The HEAT-HOUR does that.
4. A unit which makes the work of the state regulatory bodies easier and increases the confidence of the public in the Commission and the Utilities.
   The HEAT-HOUR does that.

And so I offer you the HEAT-HOUR as a means of dispelling the fog of doubt and uncertainty in the mind of the customer and convincing him that in any place and at any time he received for his dollar a full dollar's worth of the only commodity in which he is really interested—HEAT.



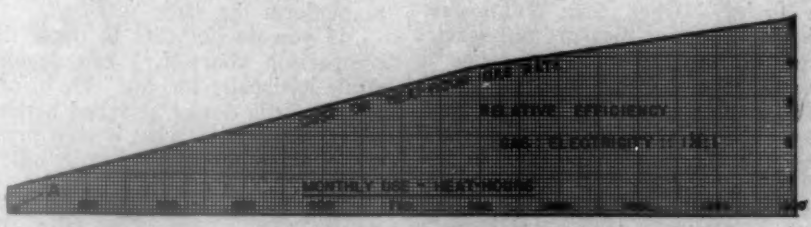

**For Use:**

**(1) Determine present average electric bill.**

**(2) Place point "A" of loose section at point on electric cost curve representing present average electric bill.**

**(3) Determine use in heat-hours (3415 b.t.u.) of added appliance or appliances and find this point on horizontal scale of loose section.**

**(4) Follow this ordinate to intersection with curves "cost on heat-hour gas rate" and "cost on inducement electric rate." Opposite this intersection with gas curve, on left-hand margin, read total cost of present electric service plus added appliance on gas and opposite this intersection with electric curve read total cost of present electric service plus added appliance on electricity.**




**Relative efficiencies of gas and electricity are compensated for in fixing scales.**

**If the customer now uses both gas and electricity, present average gas bill should be placed over present average electric bill and the use of the proposed new appliance added to the present gas use as indicated on horizontal scale on loose section. The device will then indicate increment cost of operation of new appliance on gas or electricity.**

# Economics of the Gas Industry*

By

**A. M. Beebee**

Rochester Gas & Electric Co.
Rochester, N. Y.

THESE are days when great publicity and consideration are being given to the electrical problems of the country and we hear much of the great social benefits which are supposed to result from the Government's experiments in that industry. As a result, one is likely to form the opinion that the gas industry plays only a minor role in our present system of society and in its efforts to return to a normal economic condition.

Yet, when carefully analyzed, the situation may be similar to that of the old lady of whom we have all heard, who could not find her glasses when all the time they were on her forehead.

The gas industry in this country is built upon fundamental economics of a nature seldom realized by the layman, and even by many in our own industry.

Mahatma Ghandi, in one respect at least, serves as an example that many of our social planners today might well afford to pattern after. He spends great quantities of time in meditation. Today there is, it seems, a great tendency to rush hither and yon chasing phantom objectives, many of which, upon careful analysis, do not appear to hold any lasting benefit to the country.

Our civilization today is made up of all kinds of extremes. Ghandi, while he spends vast numbers of hours in meditation, gets nothing done. In this country we run around doing a great many things when perhaps we might profit by some sound meditation.

Let us meditate for a while and turn the spotlight on the place that the gas industry occupies in our present day system of society. Where do we stand? Where are we headed? What position can and should we play in the much heralded development of "A More Abundant Life"?

I question if everyone would not agree that two of the essential points in the development of that more abundant life are:

1) The building up of the purchasing power of our country.

2) The development of energy in its cheapest form to become the slave of our people.

One without the other is of doubtful value. The former makes the latter possible and enables us to absorb and enjoy the fruits of the use of energy.

This cycle can be the means of developing the necessary leisure and luxury to realize the right which our Constitution is supposed to give us, i. e. "the pursuit of happiness."

The development of energy has been, from time immemorial, the keystone of the progress of civilization. It bids fair to continue in that position in the future. Energy is the means whereby our wants can be satisfied without drudgery.

Let us consider the main sources of energy in our country and then let us compare our uses of this energy in the past three or four years, when we feel we have been in this valley of despair, with our uses of them during the so called "hey days" of 1923 to 1929.

TABLE I

| Energy used in the United States | Last 3 Years | 1923-29 | % Change |
|---|---|---|---|
| Natural Gas | 7% | 5% | +40% |
| Water Power | 9 | 5½ | +63 |
| Oil | 23 | 18½ | +24 |
| Coal | 45 | 60 | —25 |
| All other forms | 16 | 11 | +45 |

Later we will see the great significance of this table when the premises which we have outlined are considered in greater detail. Attention is called, however, to the large increase in natural gas and water power and the decrease in coal.

The only apparent way that our purchasing power can be built up is by reducing unemployment, and unemployment cannot be relieved by developing at increased cost, sources of energy that are scant employers of labor. It would seem a fundamental fact that until the production of energy requiring less labor can be developed more cheaply than other forms of energy, it should have no place in our scheme of things. Of course it is true that we cannot stand in the way of progress and when energy employing less labor in its production can be produced cheaper than other forms eventually society as a whole will benefit, though in the transition period heart breaking adjustments may have to be made. However, when such is not the case, it absolutely has no place, at least not until we have solved our unemployment problems. Please bear these points in mind, as we consider the tables which follow.

Now let us consider these various sources of energy and their estimated known reserves. Reserves are many times subject to dispute, but the following figures are taken from authorities of repute and are sufficiently accurate for our needs.

TABLE II

| | Ultimate Known Reserves | Annual Present Rate of Use | Life at Present Rate of Use |
|---|---|---|---|
| Natural Gas | 40 Trillion cu. ft. | 2 Trillion cu. ft. | 20 Years |
| Oil | 13 Billion barrels | 910 Million barrels | 14 Years |
| Water Power | 38 Million H.P. | 12 Million H.P. | |
| Coal | 2500 Billion tons | 390 Million tons | 4800 Years |

The above figures are most significant. The total potential water power is but three times the present installed capacity which (from

* *Paper read at the Meeting of the Empire Gas & Electric Association held at Albany, N. Y., April 12th.*

Table I) now supplies only 9% of our energy. Therefore, the total water power in this entire country can only supply some 27% of our present requirements. These figures emphasize the statement frequently made by many men, such as Edison and other students of energy, that coal is the fuel of the future. In this regard our country has, an often unappreciated fact, the good fortune of being blessed with a tremendous coal supply and as time goes on this fact is apt to become the largest single factor in the future of this country. It bids fair to eventually help us become the most powerful country in the world.

### Labor Employing Features

Now let us consider the labor employing features of these various sources of energy, together with their relative costs.

*Natural Gas*—The production of natural gas of course employs labor but to a rather limited extent, though in general its costs of production per B.t.u. are considerably higher than for coal. Its transportation in pipe lines, however, requires a minimum of labor.

*Oil*—The production of oil also employs labor but again to a limited extent and when transported by pipe lines it requires little labor, while that which is transported by rail employs labor to a larger extent. Its cost of production per B.t.u. generally is higher than coal.

*Water Power*—Here probably is the world's smallest employer of labor and in general its cost is greater than coal. Recent studies show that only some 13% of the cost is all that goes to cover operation and maintenance, and 87% to cover fixed charges.

*Coal*—Employs a whole army of labor at the mines mining the coal, on the railroads transporting the coal and at the plants converting it into useful power, together with the steel and allied industries that feed the railroads, mines and power plants. It also is our cheapest and most abundant source of energy. Recent studies show that some 56% of the cost of steam produced power goes to cover fuel operation and maintenance expense at the plant; the balance of 44% to cover fixed charges.

At this point may we call attention to the fact from Table I that in our period of unemployment despair the non-labor using sources of energy, water power and natural gas, have increased 63% and 40% respectively, while coal (our greatest labor employing source), has decreased 25%. This point is worthy of more than passing interest. And more important perhaps is the fact that some of the non-labor employing forms of energy have reserves that give indication of only lasting a comparatively short span of years. This leads to the conclusion that these limited forms of energy of high form value, should not be further pushed on a general energy market, especially if, in their development, they are non-labor utilizing. Such forms of energy should be conserved for their rightful, logical, market to enable a longer life of the present supply to result. Not to do so in these times of stress merely adds to our unemployment.

Imagine, if you will, the chaos that would result if the coal industry should suddenly decide to force onto an unwelcome energy market its total reserves over a period of a few years. Yet this principle is the basis of some of the plans to be discussed later.

Also, from Table II, we can conclude that 10 to 20 years from now, when our reserves of non-labor using fuels fall off substantially, a cycle of employment may result which will make for a return of unusual prosperity; so that ultimately we should have nothing to fear. It is, however, the immediate present with which we are concerned. Are we moving in a direction that will hasten or retard that return?

It seems unfortunate that surplus fuels should make for hard times. We all know, however, that war and other forms of destruction invariably have made for temporary prosperity, by reason of the resultant employment created. It is not the surplus of fuels that causes trouble so much as the fact that the ones we are tending to use, at added cost, do not aid in the utilization of our labor and therefore tend to restrict purchasing power.

In summing up, therefore, we may say that until energy can be more cheaply produced by forms other than coal, or until we have solved our unemployment situation, coal is our fuel of the future.

However, before we draw further conclusions from the previously outlined data, let us consider a few more fundamentals.

As previously mentioned, energy is our keystone of progress, by providing ability to do work (mechanical energy), heat and light. Energy can be transported and converted into its various forms such as heat, light and power, and gas and electricity are merely convenient forms of transmitting energy. Why should we have two forms of transporting energy? Why not concentrate on just one? This latter idea seems to be the objective of our present administration. The answer is that there is a very good reason why two forms of energy distribution have developed as they have.

It is interesting to study any highly developed industry. As a rule we find some definite economic reason for its development. Our industry is no exception to this rule.

Energy from various fuels can be converted into useful heat with a high efficiency of conversion, in general from 60% to 85%. However, when such a source of energy is converted into power or mechanical energy, large losses are involved, whether it be by gas engine, turbine, steam engine or electric generator, so that the resultant efficiency of conversion to power will run from 15% to 35%. Please bear this point in mind as this is a very vital and important fundamental which has been responsible for the two forms of energy distribution, as explained below.

As mentioned earlier, gas and electricity are merely convenient forms of transmitting energy. Gas is energy in a form that is readily and efficiently converted into heat. However, to convert it into mechanical energy or power, involves the large losses already referred to. Electricity on the other hand is potential mechanical energy and can therefore be converted into useful work with a high degree of efficiency, even as high as 90%. However, in the conversion of the energy of any fuel into electricity the large losses have already been incurred, which gas or any other fuel must involve to be used for mechanical energy or power. Therefore, in the mechanical energy fields, power fields, or light, we find gas has generally no great fundamental conversion advantage and electricity has the advantage of economic application.

But where heat is desired, to use a form of energy such as electricity, which in its production involved these heavy losses, to compete with a form of energy which escaped these losses such as gas, is like trying to make water run up hill. Please bear this last statement in mind, as we later develop our story.

It is true that in the eventual utilization of heat, electricity has generally a higher efficiency of application than gas, for the reason that gas involves the heat losses in its products of combustion. However, these losses are generally of an order of 10% to 15% which is but a small part compared to the 65%

*(Continued on page 68)*

# The Distribution Conference

**The Distribution Committee of the A.G.A. held a successful conference in Cleveland, O. on May 2, 3 and 4th. The attendance, estimated at 300, comprised executives and operators from every section of the country.**

**Mr. C. E. Gallagher, President of the East Ohio Fuel Company, welcomed the delegates to Cleveland. Mr. P. S. Young, President of the American Gas Association, spoke on the diversity of interests in distribution practice and encouraged greater efforts toward economy which is a vital necessity in the continued growth of gas utilization.**

**A particularly interesting feature of the Conference was a visit to the A.G.A. Laboratory where the delegates saw a number of actual tests being made on various gas appliances.**

**The variety of papers presented by authors assembled from all parts of the country, secured an attention that proved the value of the information presented and makes the selection of any one of particular importance impossible.**

**Papers presented by W. M. Henderson, R. W. McClenahan, and Allen D. MacLean are included in this issue.**

# Pressure Control and Extension Fitting For Pipe Lines

**By W. M. Henderson**

Superintendent Gas Distribution, Los Angeles Gas & Electric Corporation

FOR repairs, replacements or extensions it is frequently necessary to control the pressure within a pipe conveying a fluid, such as gas, oil, steam, or water. On high pressure gas this is usually accomplished by effecting a shut-down by means of the nearest valves. Rarely are such valves conveniently located for purposes of the shut-down; consequently, large sections of the line must be rendered inoperative by disposing of the pipe's contents before work may be performed. Seldom, in such cases where shut-down may be arranged, will the line-valves produce a tight shut-down. In many cases, particularly on gas distribution or water systems, the shut-down means considerable inconvenience to consumers, and necessitates individual notice before and after service is restored.

On low pressure gas lines this is usually accomplished by the installing of bags or stoppers; however, to accomplish this it is necessary to work in the presence of escaping gas with its accompanying hazards.

For branch line extensions, or branch tie-in, it is equally desirable to control the pressure. This is commonly done by either installing a saddle, or welding a fitting to the mainline, to which a gate-valve is connected. The mainline is then tapped through the gate-valve, and the extension connection made with the valve closed. After this operation, the valve seldom has further use.

To avoid the inconvenience associated with shutting down a pipeline, to reduce the cost of such work, and eliminate any danger in performing these jobs, the Pressure Control Fitting is offered as a solution. In a modified form, it is available for making extensions from lines under pressure without the permanent installation of a valve or other type of shut-off, and without interfering with the line pressure.

The fittings are fabricated from steel or cast iron, and are welded in place or mounted on the pipe as a split-fitting with wedge or bolts.

A set of tools is required for each size fitting. These consist of stuffing box, gate valve, expansion plug, and plug wrench. Any standard tapping machine may be adapted to use with the fitting.

The drawings and photographs illustrate the application of the Pressure Control Fitting, and the Extension Fitting, as well as use of the tools.

A brief investigation into the utility of these fittings will indicate that gate valves may be almost entirely displaced or installed only where they are subject to frequent use or for emergency.

The design and principle of the Pressure Control and Extension Fittings is such that they are more effective than a valve in that they insure a positive shut-off. The fittings need not be installed until the occasion directs, and then at the exact location desired. They cost from one-fourth to one-third (depending on size) of the price of a gate-valve. The fittings are always effective; if left in the pipeline for a long period, and the "well" becomes filled with pipe scale or other deposit, it may be easily removed by inserting, through the stuffing box and gland, a pipe with serrated edge, and allowing the line pressure to blow the foreign matter to the atmosphere.

A very useful application of the Pressure Control Fitting is found in the replacement of a section of line by using a by-pass.

In this respect, a few experiences will better illustrate their service:

Palm Springs is a very popular desert resort, with a winter population of 2,500, or more, people. That community is served by 125 miles of 4-line, with a pressure of 125 pounds. The line terminates at Palm Springs. The line crosses a large wash on a highway bridge. Last winter the Highway Department proceeded to

Figure 1. Pressure Control Fitting, showing screw Cap and Plug.

Figure 2. Cutting the Pressure Control Fitting for installation on existing main.

Figure 3. Beveling sides of Pressure Control Fitting for welding.

Figure 4. Pressure Control Fitting 'tacked' and ready to be welded.

replace the bridge with a new concrete structure. To remove the line would mean a shut-down, as there was no valve on the line below the bridge.

The Pressure Fitting is designed for just such jobs. A fitting was welded onto the pipe line above and below the bridge. An Extension Fitting was welded to the line above the upper "pressure control fitting" and below the lower "control fitting." A by-pass of 2-inch pipe was run across the bed of the wash and connected to the Extension Fittings. The plugs were then set in the Pressure Fittings, and the line on the bridge was removed. Later, after the bridge was completed, the line was replaced and tied at each end of the Pressure Control Fittings, and the by-pass removed, leaving the two 4-inch Pressure Control Fittings and the two 2-inch Extension Fittings in place. This work was all performed without any interruption of service or reduction of line pressure.

Another excellent example illustrating the utility and economy of the Fittings was where a short piece of main was to be removed from the flowline of a large storm drain. This occurred in a suburban section of the City of Los Angeles. A single line of 3-inch high pressure pipe served a number of blocks containing 197 consumers. This was the sole source of supply; to cut out the section would mean the interruption of supply to all these consumers, necessitating notification both before and afterward. The cost of such notice, turning the meters off and on, and relighting pilots would represent at least $197.00, to say nothing of the inconvenience to the consumers.

The installation of the pressure control fittings adjacent to the work, and the Extension Fittings to install a short by-pass allowed the line to be cut and relocated without interruption of service or reduction of pressure.

Frequently line valves at intersections are found leaking, or impossible to operate to get an effective shut-down. In such cases the pressure control fittings are installed ahead of the valves, on each side, and the line pressure shut off. (Where the supply is from both directions, no by-pass is required). The valves are then removed. The same procedure is followed to remove old leaking fittings.

Both types of Fittings may be made in any size, limited only to the size of shell drill available. For speed and convenience, air-powered drills are used on sizes 2-inch and up, although hand drilling may be done.

Figure 5. Pressure Control Fitting welded to main; primer coat applied while still warm.

Figure 6. Pressure Control Fitting being tested for leaks under 60 lb. of air pressure.

Figure 7. Oil bath in top of P. C. Fitting to lubricate shell drill during tapping. Soap is used to prevent oil from draining to bottom of Pressure Control Fitting.

Figure 8. 5" N. R. S. Gate valve on top of the P. C. Fitting.

Fig. 9. Pneumatic tapping machine equipped with Shell and Pilot drills.

Figure 10. Tapping machine removed, rubber stopper ready to be inserted thru stuffing box.

Figure 11. Rubber stopper lowered into P. C. Fitting and expanded, shutting off gas.

Figure 12. C. I. Screw Plug ready to be inserted, after removal of rubber stopper. Gate is closed, line is alive.

Time required for installation, welding fitting in place, and drilling, is shown below:

| *Pipe Size* | *Welding* | *Drilling* |
|---|---|---|
| 1″ | 10 Min. | 6 Min. |
| 2″ | 15 Min. | 20 Min. |
| 4″ | 35 Min. | 20 Min. |
| 6″ | 60 Min. | 30 Min. |

The welding of the Extension Fitting, and drilling of main line, require but half the time listed, as but one weld is necessary, and one cut.

Fittings have been made in sizes 1-inch to 6-inch diameter. As of April 1st, over 1,300 installations have been made in a period of two years. The Fitting costs, made in our shop with available equipment, labor and material, in sizes 1″ to 6″, are: $1.65 for the 1-inch, ranging to $10.75 for the 6-inch Fittings.

Use for these fittings is increasing on the system of the Los Angeles Gas and Electric Corporation. Valves or plug cocks are installed only where there is frequent occasion to operate. The Fittings are recorded, as installed on the Distribution maps by a symbol, as it may be desirable to make future use of same.

These fittings represent two years of development, and their utility, simplicity, and absolute safety are now apparent. They eliminate the reduction of pressure, or the shut-down of the pipeline to perform work. Thus, interruption of service to a consumer or a section of the distribution system is avoided. Their cost is low, and usually a big saving in other indirect expenses results from their use. The installation and operation are simple, and the time necessary to install the fitting is less than the preparation required to effect a shut-down on the line. The general use of the fittings on main and service work eliminates all need of exposing the workmen to escaping gas (except in cases of leaks and line breaks), and this removes one of the hazards now present in distribution of gas.

Figure 17. Two-Inch Pressure Control Tools.

Figure 13. P. C. Fitting plugged, gate removed.

Figure 14. P. C. Fitting Capped; installation complete.

Figure 15. Using Torch to cut out old fittings. High Pressure gas shut off with three P. C. Fittings.

Figure 16. Extension Fitting (2″) welded to a main (4″). Ready to test weld prior to tapping.

# Factors And Trends In Meter Maintenance

By

R. W. McClenahan

Assistant Manager, American Meter Company, Philadelphia, Pa.

ON approaching Meter Maintenance, it is best, first, to define our subject. By this term we refer to all operations that are concerned with improving and sustaining the performance of meters on a gas distribution system. A complete aspect of these operations naturally includes certain policies and practices of both the distribution and administrative departments, which are specific to our subject and supplementary to the important functions of the meter department. The routine application of correct shop practices, and the proper mechanical reconditioning of service equipment, are essential elements in successful meter maintenance. The other primary elements in this subject, however, are no less important. They have increasingly engaged the attention of gas engineers, departmental superintendents and company executives. This paper will, therefore, chiefly concern itself with that phase of the broad subject.

### Meter Performance and Its Effect on Revenue and Public Relations

We shall define Meter Performance as the percentages of total incoming meters in each test class. Correct meter performance, therefore, covers incoming meters which fall in the correct test class. Since Operating Revenue is derived ultimately from the sale of gas, the degree of performance becomes at once paramount. Generation, transportation, distribution and utilization are highly important factors in the transfer of a given volume of gas from the company to the customer. This transfer becomes a sale when, and only when, the volume is measured and registered by the meter. It follows that correct meter performance and economical meter maintenance are inherent problems of gas company management.

In addition to its function in the receipt of revenue, the meter is a source of expense through routine charges for set and remove, testing, repair and replacement of equipment. This account is generally charged to the distribution department and it is essential that it be kept at a minimum, compatible with good performance. The final consideration is the correct amount of maintenance required to yield a desired standard of meter performance.

Two significant points suggest themselves. First. That maintenance yields performance. True, there are many conditions of service and equipment which influence performance, but effective maintenance recognizes and accounts for these conditions. In the second place, meter maintenance is necessarily a continuous procedure. Many, no doubt, have viewed this reality and have dismissed it with philosophical resignation. Let us not lose sight of the fact that in this apparent handicap, there is a source of great efficiency. Past performance experience offers the soundest basis to current maintenance practices toward profitable future achievements.

Accuracy is the prime asset of any measuring instrument. This assertion is not merely the restatement of a threadworn truth. It represents our base point of reference in considering meter performance. The meter stands as sole arbiter of the customer's and company's interests. Accurate equipment imposes a fair charge on the customer and yields a corresponding revenue to the company. In the event of a dispute, correct meter registration is a most effective agent in the hands of the company. The meter continuously resides on the customer's premises and monthly it touches his pocketbook. In the fullest sense, it is the outpost of public relations.

Second in importance is the cost of measurement per meter year or per thousand cubic feet of gas sold. The importance of this cost is receiving increased recognition as distinguished from unit repair costs, which are of prime importance to the repair department, but must be considered as a part of the total "Measurement Cost" figure.

In addition to an efficiently and economically operated repair department, which is axiomatic to satisfactory performance, the correct solution to the whole problem of meter maintenance becomes a creative function. It involves the selection of a desired standard of performance and the further selection of those characteristics of performance which contribute to that standard and the rejection of those which detract from it. The result places the greatest possible number of correct meters in service over the longest economical period. In such an achievement there is no ground for haphazard or rule-of-thumb methods. It is a scientific problem calling for scientific analysis.

Accuracy, Standard of Performance, and Measurement Cost are related factors in Meter Maintenance. The closeness of this relationship becomes more and more convincing as research in the field progresses.

### Methods of Analyzing Performance

Probably the simplest and earliest type of performance analysis consists in recording the incoming test of all meters; and at the end of a given period of time, usually a year, these are combined by classes (correct, fast, slow, stuck and non-register) to give the number of meters and the percentage of total meters in each test class. A further step consists in balancing fast and slow inaccuracies to secure the average error, or accuracy of registration, for all the meters tested. Such figures obviously represent the average performance of meters returned from a system and tested. They show a cross-section performance of the "samples" removed from the system and, as such, they are of real value. As sources of operating information, however, they are rightly open to the recent comment of Mr. C. H. Thatcher, Distribution Superintendent of the New Haven Gas Light Company, before the Operating Division of the New England Gas Association.

> "These figures (average performance results) do not show sufficient data for the determination of operating policies.

Averave performance of the whole group is made up of the combined performance of separate groups, some of which show good performance and others show poor performance. In the average figures these divergent performances are not apparent."

### Origin of Demand for Better Records

As previously stated, the object is to take advantage of all factors tending to sustain or improve performance and to minimize or eliminate all factors tending to lower performance. These opposing factors must be detected before they can be dealt with effectively.

The reports of that period indicate several fundamental reasons which stimulated this trend. Among these were the following: (1.) A search for improved operating practices following the disturbed economic conditions of the war period. (2.) A growing realization of the changes in load conditions which confronted the gas industry. (3.) A feeling that in the general advancement of technical knowledge, the field of gas measurement should have its share of consideration to keep it abreast of the times. (4.) The necessity of re-establishing routine maintenance schedules, many of which had been disrupted by war conditions. (5.) A growth in association activities provided excellent facilities for committee research and inter-company cooperation. (6.) The urge to stimulate the sale of gas as the ideal fuel in the domestic, commercial and industrial fields.

It required several years for these reasons to crystallize. They are clearly summarized in the 1924 report of the Pacific Coast Gas Association Consumer's Meters Committee:

> "Improper registration of poorly maintained meters affects each and every department of a gas company. . . . Any reasonable amount of money expended by a gas company to sponsor investigational work on meter performance, while it may appear costly, will eventually lead to a reduction in maintenance, the choosing of meters best suited to the conditions under which they are used, and improve public relations with the individual consumer. This latter item affects the sale to the consumer to a very marked degree."

### Reasons Advanced by P. G. A. Committee

The work of the Pacific Coast Meter Committee for the years 1921-1925 involved the establishment of a simple and flexible system of recording meter performance data. It was designed for use by a number of companies with a view toward intercompany comparisons and uniformity in record practices. The work included a study of the essential data to be entered in these records. According to the recommendations, "The desired information must consider the meters both from their degree of accuracy, and the period of their continuous service." The reports also refer to "classifications" of various tests and subsequently there was drawn up an itemized list of the data required, including: (1) Life of Diaphragms. (2) Last previous repair date, and (3) Nature of last repair.

Here we find several important departures in the methods of performance analysis.

*First*, we find a change in practice from "average performance data" to "group performance data." After an early attempt to investigate this problem on an average performance basis, it was readily seen that average figures could lead to erroneous conclusions and that more detailed analysis was required.

*Second*, there is a clear recognition of the inter-relation of performance and duration of service. This service referred to the test period, in which the investigation was then primarily interested.

*Third*, we see recommendation for "group analysis" based on classification according to repair data.

*Fourth*, a clear recognition of the necessity of a simple and continuous analysis of performance records as a periodic guide in laying down effective maintenance practices.

### Record Research in New England

During this same period, several companies in New England adopted the same far-reaching insight into meter maintenance. In the May 1922 issue of the American Gas Association Monthly, there appeared an article by Mr. H. Vittinghoff of the Stone & Webster Company, describing an exhaustive study of an economic schedule for periodic testing and repairing of gas meters. The object was to clarify a difference of opinion as to the proper test period, and to provide reliable information on this point. The investigation covered three companies and involved tests of approximately 7000 meters. Before long, it developed that the results from two of the companies checked quite closely but that those from the third company were considerably different. Investigation developed the conclusion that this divergence was due to a greater number of old meters in service for the one company. Beyond this point the investigation turned to a group analysis of the 5 Light and 3 Light meters, the latter group offering the most fertile field of comparison due to factors of obsolescence, small capacity and greater age in service.

This excellent paper attacks these groups from three sound angles: (1) The desirability of meter accuracy. (2) The effective service obtained from a given group of meters, and (3) The maintenance cost over a period of years. It develops the following interesting points:

(a) Comparative group performances, particularly in the correct and D. R. classes of test.

(b) The effects of performance on maintenance costs, over a period of time, due to the more frequent shop returns of one group, although the average repair cost per meter of this group may be about the same as other groups.

(c) The advantage gained by prolonging the period of inspection, based on performance results, and by the elimination of very old meters which "will not hold their accuracy for as long a period of time as those of more recent construction, which therefore, necessitates that they should be more frequently overhauled to maintain the general accuracy of registration of all meters."

(d) The analysis illustrates the importance of caution in the general application of performance data. Specific conclusions for the individual company must rest on data from that company. General, or composite data from several companies show broad trends in which local factors are minimized or eliminated. As such, they represent basic trends of performance which enter into local conditions, but the application of these trends to local conditions must rest on local analysis.

Mr. Vittinghoff's investigation gives us a convincing example of the validity of group separation in performance analysis. It also removes this analysis from the purely theoretical field and places it directly in the field of sound practice. It further to maintenance costs their proper significance in terms of service resulting from unit repair cost.

### Contribution of Four Cardinal Points

In 1923, the late Mr. Harry A. Norton, of the Nathaniel Tufts Meter Works, published the result of a study of comparative meter performance and proposed a system of "Four Cardinal Points" in the use and care of consumers' meters.

Mr. Norton's report covers data from seven companies, totalling over 200,000 meters in service. It refers to the comparative performances of the 3 Light and 5 Light meters, which were the objects of special interest at that period. The analysis coincides with our previous examples in following strictly the group method of comparison. The tabulations indicate the marked differences in group performances which may exist. These differences were most apparent in the correct, slow and non-register test classes.

With this data, Mr. Norton submitted a precise system of records patterned to include the essential information and to facilitate periodic summaries of the resulting statistics. The "Four Cardinal Point" system of maintenance, which he advanced, received widespread consideration. In some instances there developed a certain confusion in associating this maintenance system with any discussion of the purpose and value of meter records. The distinction should be clear. The "Four Cardinal Point" system was based on analyzed performance data. The record system was a separate unit and included the forms and methods for analyzing performance data. As such it is of fundamental value and a great many of our present statistics have been derived from the continued application of this basic system of meter records.

### Improvement of Repair Methods and Records

By the year 1924 the value of performance analysis had taken root and the practice was being launched by a number of companies who now had definite means of recording and tabulating essential data. Different thought — new thought — was centered on the work. Mr. C. R. Miller, Chairman of the 1924 Consumers' Meters Committee of the Pacific Coast Gas Association, expressed this as follows: "In summarizing the collected data, it is again suggested to you that you ask yourselves what you want to know about the meters and then proceed to answer it, but at the same time keep in mind that you will not ask yourselves this question if you do not see the need for it. Let us urge that this need does exist."

There was a widespread response to this stimulation to research. The immediate activity centered in the improvement and standardization of repair shop practices. The combined thoughts of company officials and manufacturers were centered on the fullest improvement in routine handling, testing and repairing of meters.

There were several reasons why the trend of investigation advanced along the path of repair methods. In these lay the most definite source of immediate improvement. The recognition of that fact was, of itself, sufficient to stimulate the development of better shop methods. Efforts were persistently directed toward devising the one best repair procedure, and great benefits have been derived from better shop efficiency.

In the 1932 report of the American Gas Association Sub-Committee on Meters, we find a continuance of the investigation of repair practices supplemented by data on the following:

1. Comparison of Performance of Old and New Meters.
2. The Policy of Handling Idle Meters.
3. The Policy of Condemning Meters.

### Revived Interest in Maintenance Cost

By these topics we see an effort to supplement the valuable progress of improved repair practices, with an equal advancement in the segregation of meters which do, and those which do not, lend themselves to economically sound repair. Bear in mind that these factors, repair and replacement, are not competitive or mutually exclusive branches of correct maintenance. They are complementary functions in keeping equipment in good servicaeble condition from the point of view of company operations, revenue, correct performance, customer service, public relations, and measurement cost itself. The repair department is, and should be, rightly concerned with the mechanical repair of equipment at the lowest possible cost. With the growing acceptance of the principle that meter maintenance includes factors beyond the repair point, there is a growing interest in meter maintenance by the distribution and administrative departments. For this reason, repair costs, as such, are being supplemented by "measurement costs" in the same practical sense as cost of production or cost of distribution. It costs money to measure gas whether this is represented by repair cost, replacement cost, or any other cost. The best results are obtained when all of these factors are balanced, rather than treated as opposing factors. We must not minimize the necessity of efficient meter repair. We cannot escape the persistent fact that this efficiency is increased, that the results obtained are more permanent, and that the value of repair is greater, when dealing with equipment within its economic age.

A short time ago an executive of a large gas company was asked why he had recently installed a complete meter record system, after preliminary analysis, when he had previously stated that they could not afford it under existing conditions. He laconically replied, "We couldn't afford not to."

### The Present Viewpoint

These and many similar thoughts have engaged the attention of gas company officials in recent years. Mr. Henry W. Battin, Chairman of the Distribution Committee, 1934, summarized certain important consideration in his annual report.

> "Since our revenue is based on readings of meters it is naturally important to have them register accurately for a reasonably long period of time. . . . The present problems of gas measurement are vastly different from those of the past. . . . A study of this matter (declining correct performance with increased age) may indicate that a more liberal basis of condemnation of old meters should be adopted as a means toward greater economy. . . . Every interruption of supply, which occurs in a meter, and every leak, is a bit of poor gas service which present-day conditions warn us to avoid. Progress in this direction will pay dividends in better customer service and decreased operating expense."

You will see that these thoughts are more concisely expressed, and more specifically stated, than they were in the early Twenties. The language is tuned to the demands of present conditions but the points agree fundamentally with considerations which have formerly stimulated improved meter maintenance.

As we face the modern aspect of the question, we notice not only the fundamental similarities, but also two important exceptions, to the past. In the first place, the factors

*(Continued on page 66)*

# Service Regulator Testing

By

**Allen D. MacLean**

Chief Engineer, Pittsburgh Equitable Meter Company, Pittsburgh, Pa.

THE development of high pressure gas distribution systems made necessary a pressure regulating device to interpose between the distribution system at high pressure and the consumers house piping which is at low pressure. The actual design of this so-called service regulator has gone through a number of development stages and there has been evolved a fairly uniform and consistent piece of equipment for this purpose. There appears to be, however, quite a lack of uniformity in the method of testing and servicing the service regulator in practise. Some of this discrepancy can be accounted for by the divergence in local conditions, such as the pressure in the high pressure lines, type of gas, etc. Some of it can be accounted for by variations in standards of pressure and safety in various companies. However, most of it is probably due to the fact no set standards or test method has been developed.

It would seem that with such a piece of equipment as a service regulator on which satisfactory customers pressure and, more important, safety depends, that a somewhat uniform method of testing and servicing could be developed. In addition to customers service and safety, unaccounted for gas occasioned by blowing safety seals or safety valves is a serious consideration. It is very probable that if due consideration were given these factors most gas companies using service regulators would develop a standard routine in checking and repairing this important piece of distribution equipment.

It would be a convenient thing if it were possible to install a service regulator and then forget it, like a tee, or elbow or some similar fitting. But because it must move mechanically, and must continue to perform certain important functions over a period of time, it does demand a certain amount of attention. Yet it would not be good practise to set up a too rigid and costly procedure in testing and repairing service regulators. It does not seem necessary that the rigid rules, such as are used in meter inspection and repair, would be necessary in the case of service regulators.

## Testing Domestic Meters

In the matter of domestic meters, we have developed a very satisfactory and workable method of testing and servicing. The requirements of a new or repaired meter are simple—it must be accurate, and it must, on being set, continue to operate accurately over a long period of time. However, the requirements of a good service regulator, new or repaired, are not as clearly drawn. In general they would be as follows. A service regulator must

1. Maintain a uniform operating pressure at *all appliances* independent of the number of appliances in use.
2. Prevent the possibility of dangerous over-pressure on the domestic meters, the house piping or appliances.
3. Maintain as low as possible a metering pressure, and still give satisfactory pressure at appliances.
4. Be able to respond to quick changes in rate of flow occasioned by thermostatic valves, instantaneous water heaters, etc.
5. Maintain these characteristics over a long period of time in spite of changing inlet pressure and other variables.

In the case of domestic meters, removal for test is made at given periods which are either prescribed by a state law or indicated by experience. In general the service regulator is not subjected to any such periodic inspection, and in many localities is only inspected if a service complaint is registered. This will usually occur only in the case of insufficient pressure. If we have a regulator in which the safety seal is blowing, quite often there will be no customer complaint, and we have the bad condition of a continuously blowing seal contributing to the unaccounted for gas

Realizing that there is a possible source of trouble which can seriously contribute to the unaccounted for gas, and that customer satisfaction and safety depends on service regulator performance, the service man is confronted with the problem of just how much should be spent on service regulator inspection and repair.

## Inspection Methods

Several inspection methods are in vogue to determine whether or not a regulator is performing satisfactorily. In some localities, particularly smaller systems, the meter reader listens to the seal and if it happens to be blowing will hear the gurgling of the mercury in the seal. This method of course will reveal only over-pressure troubles, and may detect only a small percentage of blowing seals. In larger systems it may impose quite an additional load on the meter reader.

Another method is to provide for a service regulator inspector who at intervals visits the consumer and makes sufficient tests to determine the performance of the regulator. The length of these inspection intervals will depend on many factors peculiar to the local conditions. The type of gas, the amount of dirt in the system, the age of the regulators, the type of valve material used, and the previous operating experience of the company will all necessarily be considered in determining the length of the period. It does not seem that it should be shorter than one year, and perhaps should approach five or six years under fairly favorable conditions. This type of inspection should be recorded on some sort of a satisfactory card index system so that it can be performed efficiently and completely.

An inspection of this type should be complete when made. It should

be made without resorting to questioning the consumer. It should also be made to reproduce practically all operation conditions on the regulator so the control of outlet pressure can be observed under all these conditions. This means that if a test tee on the outlet end of the meter is not provided, the meter should be temporarily disconnected at the outlet and

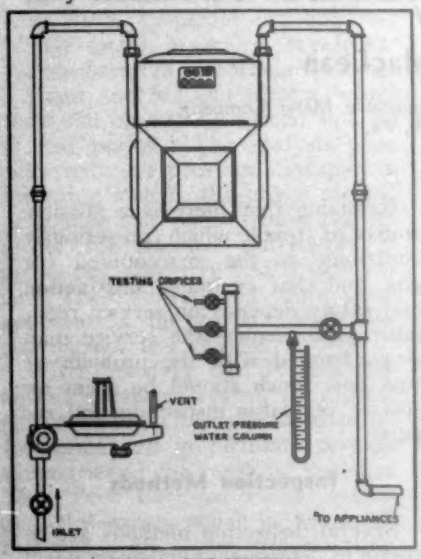



FIGURE 1. TEST CONNECTION

a connection made for testing purposes. This test connection would look something like that sketched in Fig. 1. A satisfactory water column is provided as well as valves connecting the house piping to several orifices.

One orifice should be arranged to allow a rate of flow equivalent to the setting rate which will be discussed later. Other orifices should be provided and labeled so that a rate of flow roughly approximating the maximum possible rate for this service can be selected.

### Actual Test

In making the actual test the "setting rate" is first opened, (that is about the normal rate of consumption) and the outlet pressure observed on the water column. Then the selected "maximum flow" orifice is opened, and the pressure observed. If the outlet pressure at setting rate is too high or low, it should be adjusted. If the outlet pressure at "maximum rate" falls too low, there is a possibility of a shrunken diaphragm restricting stroke, the orifice being too small for existing inlet pressure conditions, the design of the regulator not being satisfactory for the maximum rate of flow, the regulator too small for the load, or too low a setting of the regulator outlet pressure. Just how low this outlet pressure at maximum rate of flow can go will depend on the connected load. With house piping losses considered it should maintain all appliances at a satisfactory operating pressure.

All valves then are closed and the regulator made to shut off. If this shut off pressure goes much more than one inch and a half above the "outlet pressure at setting rate" the regulator valve is not closing in properly.

In this shut-off position the vent of the regulator should be tested. If the regulator is not provided with a mercury seal, but the top diaphragm is vented, soap should be placed over this vent. Diaphragm leakage can be detected in this way.

If the regulator is provided with a mercury seal it should be inspected also with the regulator in the "shut-off" position. By disconnecting the vent line and placing a soap bubble over it, valve leakage and diaphragm leakage can now be detected. If the "maximum rate of flow" valve is opened and then closed rather quickly, the water column will indicate any unusually high outlet pressure due to lag in the regulator closing.

The actual blowing point of the seal is rather difficult to test. It is suggested that the best insurance is to make certain that there is sufficient clean mercury to insure a high enough blowing pressure for the particular type of regulator being tested. Clean mercury is desirable because just a small amount of oil or dirt will cause a seal to "hang up" when once blown and will cause a lowering of the blowing point.

Another method of inspection provides for removing the regulator from the service and bringing it back to the repair shop for repairs and test. Later a routine test for this type of servicing is described.

Other companies provide no routine method for testing and servicing service regulators. Only when troubles are reported by meter readers, service men or consumers are the regulators repaired.

Obviously valves and diaphragms in regulators will eventually deteriorate to the point where they will cause trouble; in many locations it will pay to forestall this trouble by routine inspection or testing of some sort.

Just how much repair work should be done at the location at the time of inspection is also a debated question. If a simple change of valve, or cleaning of valve will put the regulator back in good operating condition it would seem logical to do this. Any further repairs, other than changing of mercury, should be made by replacing the regulator and taking it back to the repair shop.

In making tests in a shop on new or repaired regulators, a simple testing arrangement can be made which will perform a complete test satisfactorily.

In Fig. II, 1 is the service regulator under test, held in place by means of a quick acting clamping device 2. The clamping device shown here is meant to permit the rapid changing of the test regulator and will pay if there are many regulators to be tested. It can take many forms, such as a quick acting screw to clamp the regulator, air cylinder operated clamping members, etc. The method shown here is a swinging lever type with a ratchet catch, is cheap to construct and easy to operate. Where a limited number of regulators are to be tested, the regulator can, of course, be screwed on piping, just as it will be in service.

No matter what method is used for holding the regulator, there are certain precautions which must be taken. First the actual member fitting into the outlet of the regulator, whether clamped or screwed, should have the full internal diameter of the standard outlet size of the regulator. Any variation whatsoever at this point will give very erroneous results in outlet pressure reading. One of the most annoying complications from the point of view of pressure absorption and decrease in regulated

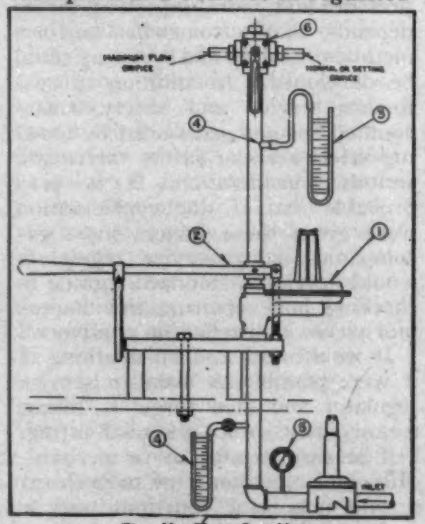



Fig. II—Test Set Up.

pressure with increasing flow is the pressure required to get the flow of gas out of the regulator into the house piping. Any restriction at this point is serious. Thus, the connection at the outlet in the test set-up should be carefully watched, it should be full pipe internal diameter, and have any cutting burrs removed from it. This same precaution, by the way, is

well to take in making a service regulator installation in practise.

Another point to be watched in this test set-up is to see that the taps at which the pressure (particularly the outlet pressure) is taken, are made so as to give true pressure readings. The approved way of doing this (as recommended by the A.G.A. laboratory committee on appliance accessory testing) is weld a short ⅛" pipe nipple perpendicular to the outlet pipe, at a location 8 pipe diameters from the regulator outlet. By drilling through the wall of the outlet pipe, and cleaning up the burr made in drilling through, this tap will give true pressure indication when connected to the outlet water column 3. The inlet pressure tap should be made the same way, particularly if low inlet pressures are to be measured. The inlet pressure can be measured by a mercury column 4 if low or by a pressure gauge 5 if high. The value of the inlet pressure should be maintained constant at the selected value during all tests and this can best be done by a regulator, which should be easily adjustable.

The control of the rate of flow should be by means of an adjustable valve at the outlet if there is occasion to make tests at many rates of flow. However, a routine test method can be worked out whereby the ability of the regulator can be quite accurately determined at but two rates of flow, and by using a three-way cock, whose ports lead to the proper sized orifices, the regulator can be made to operate at these two rates of flow by merely turning the three-way cock. This three-way cock is shown at 6.

With this type of test set-up it is possible to make a rapid and quick test which will check thoroughly all the operating characteristics of the regulator. Obviously a satisfactory pressure should be held during the normal consumption. This normal consumption is a much debated question, but for our purposes it can be assumed for a domestic service to be about 20 cubic feet per hour. Thus if we make our initial spring or weight setting at this rate of flow, we know it will be maintained in service. Thus we make one of our orifices so that with the setting pressure it will discharge just 20 cubic feet per hour, and merely by opening the three-way cock to this orifice we can make this setting.

The next important point in testing is that the regulator should shut off at a point not too high above its flowing pressure, i.e., when the three-way cock is turned to the closed position the regulator will close off on a relatively small increase of pressure. This point should not be, depending on the valve material, more than ½ to 1½ inches above the setting pressure at the 20 cubic foot rate of flow.

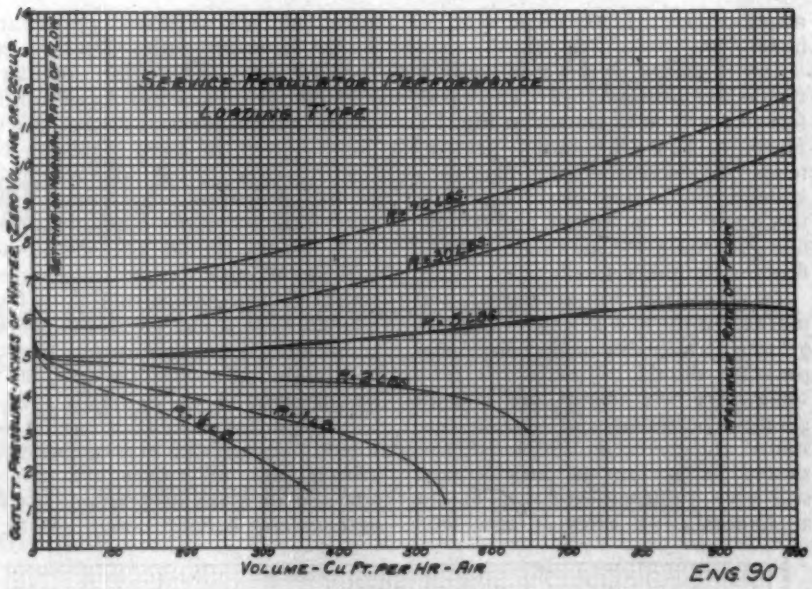

SERVICE REGULATOR PERFORMANCE
LOADING TYPE
OUTLET PRESSURE-INCHES OF WATER, ZERO VOLUME DIFFERENCE
SETTING OR FLOWING RATE OF FLOW
MAXIMUM RATE OF FLOW
VOLUME - CU FT PER HR - AIR
ENG 90

Fig. III.

### Outlet Pressure

Another point which must be watched is that the regulator has capacity ability enough to maintain a satisfactory outlet pressure. By satisfactory outlet pressure is meant one which will insure a good combustion at all appliances. This will have to be determined for each location. If this particular size regulator is to be used with, for instance, a house heating boiler, in the test the remaining orifice must be selected to represent the volume of all appliances including the boiler. Thus the orifice connected to the remaining port of the three-way valve can be made to represent this volume. When the three-way cock is opened to this port. the outlet pressure as shown by the water column should not fall to too low a value. This value must allow for pressure loss through the house piping, and also the meter.

While the regulator is on test, it should also be tested for leaks through the diaphragm. If the regulator has a single top diaphragm vent connection, a soap bubble should be placed on this connection. If there is any diaphragm leakage this bubble will break. If the regulator is provided with a mercury seal, it is probable that the top diaphragm chamber is vented through this seal, and by placing a soap bubble over the mercury seal venting connection, leaks through the diaphragm and the mercury seal can be detected.

In order to convince ourselves that it really is possible to gauge the performance of a regulator over its entire range by making tests at but three rates of flow, we need but to look at the performance curves of a regulator as shown in Fig. III. In this case we have assumed the inlet pressure to be five pounds, this representing the minimum to which the inlet pressure will go in actual service. In this connection it would seem that the lowest inlet pressure normally met with in the system should be used for the test. Using an inlet pressure higher than the test pressure merely means that there is a slight increase in the lock up value, and slightly higher outlet pressure throughout the range. If, however, the inlet pressure falls below the inlet test pressure, we have a possibility of serious outlet pressure decrease at the high rate of flow. The curve is plotted so as to show the value of the outlet pressure as ordinates and the rate of flow as abscissae, the inlet being held constant during the test.

The "normal flowing rate" should be about that rate met with when one or two top burners on a range are lit. It is suggested that 20 feet per hour is a satisfactory rate.

The maximum rate will depend upon local practise and on the performance characteristics of the regulator. The particular curve shown is for a loading type of service regulator, and can be used for relatively large rates of flow, such as met with in house heating installations. Its maximum test rate will be in the

neighborhood of 900 cubic feet per hour.

If a regulator of the "non loading" type is used, the performance characteristics will be as shown in Fig. IV. Here, because the outlet pressure tends to decrease with increasing volume, the maximum rate of flow test point will be limited, and the orifice governing the maximum rate of flow made much smaller.

In these tests the setting or normal rate is the one at which all spring or weight adjustments on the outlet pressure should be made. It is at somewhere near this volume that the greatest percentage of gas is consumed and metered. Obviously this should be as low as possible, and still give sufficient pressure at the appliances at all rates of flow with

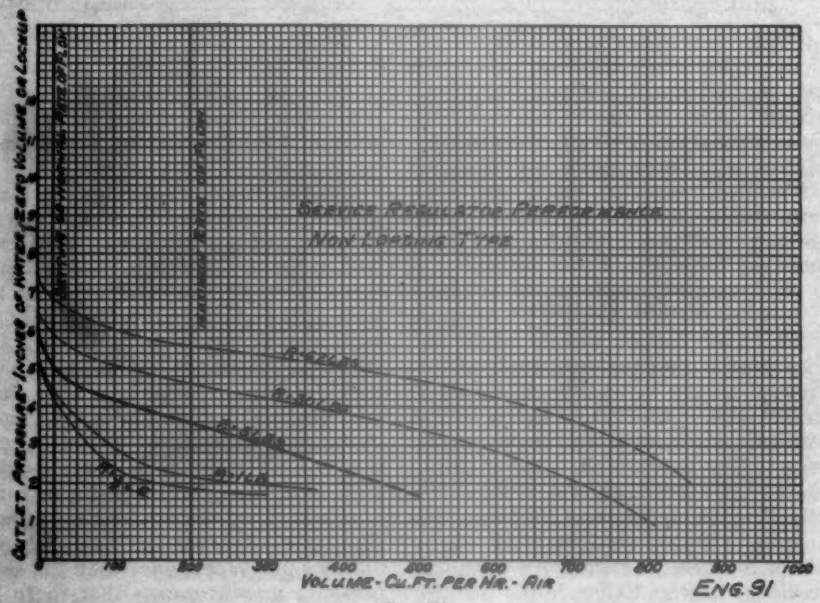



Fig. IV.

which the regulator may be used. It is the practise in some localities to set the outlet pressure spring or weights while the regulator is at the zero flow or lock up position. This would seem to be a poor practise, because the value of the lock up pressure depends not only on the spring or weight setting, but also on the valve material, and condition of the valve seat. We might well have two regulators with identical weight or spring pressure on the diaphragm, but one of the regulators, because of a little dirt on the valve seat, would lock up at zero volume, at a point 1" higher than the other. As much as ½" variation in lock up can be accounted for by variation in seat material. Now if we were to adjust these two regulators at the lock up condition so that they had the same lock up, the one which at first tended to lock up at higher pressure, but was adjusted downward, would have an outlet pressure one inch below the other regulator throughout its entire performing range, except for just at the lock up point. Even the same regulator will tend to close off at somewhat different pressures each time. For these reasons, some other flow than the lock up should be used in adjusting the outlet pressure. As mentioned above, some normal flow, high enough to be away from the lock up condition, somewhat near normal consumption, should be used as a setting point.

Next, in our test, after having adjusted the regulator at the normal or setting rate, all valves are closed, and the increase in pressure at the outlet water column noted. With a good valve and seat this will be as low as ½ inch of water above the outlet pressure at normal or setting rate. One inch increase can be considered fair performance, but anything above one and one-half inches should indicate a scarred or dirty valve, a nicked or dirty valve seat, or cramped diaphragm stroke. This should be investigated and remedied.

While the regulator is in this lock up position the diaphragm should be tested for leaks at the vent hole by means of a soap bubble.

Next, in testing, the maximum rate of flow valve is opened. From a knowledge of the performance characteristics of the regulators being tested, a minimum point below which the outlet pressure must not drop should be set.

If the outlet pressure drops below this point, it should be investigated.

*(Continued on page 61)*

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# Natural Gas Men Meet at Memphis

As this issue of the JOURNAL goes to press, the Natural Gas Department of the A. G. A. is holding its annual convention at Memphis, Tenn. We are unable to include a report of the meeting in this issue but we are publishing articles by C. F. Turner and Geo. Ketchum

# Some Aspects of the Corrosion Problem in a City Plant

By

**Charles F. Turner**

Chief Chemist, The East Ohio Gas Co., Cleveland, Ohio

IT HAS been the writer's observation during the past several years that much of or present knowledge of pipe corrosion and the methods of combating it originated with men charged with the preservation of transmission lines carrying oil, or gas, or gasoline across long stretches of open country or perhaps through sparsely populated communities rather than with that of the networks of mains and services in our large cities and towns. It is true, of course, that whatever theories and deductions we may reach as the result of experimentation along a transmission line, in all probability apply equally well to distribution systems and are therefore helpful, but other factors must be considered. The problems are different in many respects and their solutions are brought about in different ways.

We hear and read much nowadays about reconditioning programs and the economies to be effected through their use. You will hear more about these programs from our Research Associate, Dr. Scott Ewing, who is to present a very excellent paper in which is clearly set forth the method of approach to a problem in which it must be decided whether at the end of a given period of years it will prove more economical to coat completely a new line before it is laid; or to lay it bare and recondition it in the badly corroded places after some years of service; or to coat the line only through the "hot spots" discovered by the method to be described by Dr. Ewing. Whatever we have to say in this paper should not be construed as an expression of a contrary view or that we are not in accord with Dr. Ewing. The purpose of this paper is merely to set forth the distribution man's viewpoint concerning those factors and influences which must be given consideration in applying the maximum protection to our buried investment at the minimum cost.

It is the usual practice, we believe, to apply leak clamps as leaks occur, whether they be on transmission lines, mains, or services, and to recondition or replace when in someone's judgment the conditions warrant it. Replacements may be and usually are made at more frequent intervals on a distribution system in a city or town of considerable size than is necessary on a transmission line through open country. For that reason sound judgment may dictate the use of a good coating on a line to be laid through congested areas or on a main that is to replace an old one, even though the soil be only mildly corrosive. The added cost due to the coating will in many cases be more than offset by the cost of the more frequent repairs on a bare line.

### Repairing Leaks

Much time and money must be expended in repairing leaks to lines under pavement and every safeguard must be provided to prevent leakage into buildings and sub-surface structures. Then, too, in many cities the gas company is prevented by ordinance from breaking new pavement, except in the case of an emergency, for several years after it is laid. Since a large proportion of the cost to a gas company of doing work in city streets is absorbed in the labor of breaking pavement, every opportunity is taken to reduce pavement breaking. Opportunities of this nature are provided whenever a city undertakes to widen or resurface a street and in such cases it may be advantageous to replace an old

main, which is still serviceable and could be reconditioned, with a new and larger one in anticipation of a future increased demand upon it.

### Using Short Lengths

Another thing which adds to the distribution man's burdens is the necessity of using short lengths of pipe because of the difficulty encountered in maneuvering long lengths through the streets and in the trench. It is frequently necessary to tunnel under driveways, provide offsets or bends with which to avoid other subsurface structures. This means additional joints and therefore a greater joint cost per mile of pipe.

Except in outlying districts, many of the coatings which are used on steel distributing mains and services must be applied before the pipe reaches the place where it is to be used. This means that the pipe must be coated either at the point of manufacture or in the company's yards. In either case it means careful transportation and handling, aided by constant vigilance on the part of conscientious foremen and workmen, if it is to justify its cost through added years of service free from the hazards resulting from punctures, many of which are due to failures not of the coating material itself but to damaged places or bare spots.

We do not mean to infer that reconditioning of mains in a distribution system should never be considered, nor do we mean to imply that the troubles experienced by the distribution man transcend those of the pipe-line engineer; we simply repeat that their problems are different. We do, however, emphasize the importance of careful consideration before deciding that a reconditioning program is feasible. The values in the equation must be carefully determined and careful consideration given to those intangibles which no equation can cover; that is, the natural hazards involved in handling our product in populous communities.

We pass now to one of the most difficult phases of the distribution man's maintenance problem. Difficult because it is such an illusive, intangible thing to those not trained in its detection and control and troublesome to those who have some knowledge of it. We refer to the old "bug-a-boo" electrolysis, usually the result of stray currents from street railways. Perhaps it seems out of place in a discussion of soil corrosion to dwell upon electrolysis, but the two frequently go hand in hand and it devolves upon someone to determine whether this main or that service failed because of a particularly corrosive soil condition, whether the punctures were due to coating failure, or whether a stray current was passing that way on its route back to the power house. Some companies employ full time men as electrolysis sleuths, others employ men who study soil conditions and develop protective coatings but pay little attention to electrolysis. There are probably many other companies who do neither but rely on their pipe crews and repair men to judge all pipe failures and take whatever precautionary measures they think adequate.

It has been during the past few years only that many of us have come to a realization of the necessity for engineering the application of truly protective measures to our distribution systems; that much more is required than merely to choose the best available right-of-way for a new line, coat the line when we think the soil condition warrants it and bury it with a blissful feeling that we have done a good job. This realization has come most forcefully to those who have laid coated lines through corrosive soils with complete disregard for the possibility of stray currents in the vicinity.

It is indeed disconcerting to find necessary the application of leak clamps and even the replacement of considerable pipe on a line which only a few months or years previous had replaced a bare line in use much longer and with a record of few repairs. Yet this is no exaggeration; the writer has seen it happen in more than one instance. Are such instances due to dismal failure of the coating, to careless handling, or to changed conditions in the soil which cause the soil now to viciously attack the pipe? All of these may be contributing factors but the predominant one is electrolysis.

### Stray Currents

Except under extreme conditions, systems of cast iron or of bare steel are slowly attacked by stray currents, for the discharge takes place over a large area. The current density at any given point is low and we may never suspect the presence of stray currents; but run a coated main or service through such an area and the result may be entirely different. Most coating materials have some insulating value but in the average job there are usually holidays, cracks, or damaged spots in the coating through which current can escape. One ampere of current discharging from a pipe will, in one year, cause to migrate into the soil 20 pounds of iron. If this one ampere leaves through a few flaws in the coating, the current density at these places becomes very high, pits will occur in a short time, and the coating becomes loosened and porous. The more insulating the coating the greater the current density at points of discharge.

We are reasonably certain that many of the failures on coated mains and services attributed to corrosive soil conditions were in actuality produced by current discharges. We are conscious of the fact that many men are to be found who believe that it is possible to protect a line from current discharges through the use of pipe coatings which are claimed to be insulated. Probably the ones most commonly considered in this class are the enamels.

Many coatings do have a high initial resistance and some of them maintain it over several years after which, if proper tests were to be made, it would be discovered that the resistance has decreased to a very low value if not actually to zero. But assuming that the coating in question does maintain a high insulating value over a long period of time, it is, in the writer's opinion, beyond reason to hope or expect that a line or connecting service can be laid and backfilled and remain completely insulated at all points. We may think that it is but judging from past experience and observation we are convinced that many of us have taken too much for granted in this respect. How many of you are willing to state positively that there are no bare spots, no damaged places, or no cracks in the coatings which you have recently buried?

Last summer our company built and experimented with a Flaw Detector copied in principle from the Johns-Manville device of that name but more adaptable to the conditions under which we wished to use it. It brought to light some interesting things in connection with the application of our coating which, we believe, is at least of average merit. It showed the presence of minute pin holes which entirely escaped the naked eye even on close inspection. Its use along the line after it was coupled together and in the ditch ready for backfilling showed many places that had escaped the inspector's eye. And who knows how many more places may have been damaged during the backfilling or settling period. No, we doubt the advisability of trusting too blindly to the perfect insulating value of any of the commonly used coatings and in our own practice we do not rely

upon them for this kind of protection at all, in fact we shall presently show where coatings invite trouble rather than avoid it.

### Electrolysis

Many of you are wondering why we stress so greatly the matter of electrolysis and why we seem to infer that it is of paramount interest in our corrosion picture, pushing into the background soil corrosion which most of you feel constitutes your major problem. We are dealing here with the problem of corrosion in its broader aspect and its relation to distribution of gas in urban communities of considerable size where electrification in one form or another occupies the streets in common with our own property. Therefore, all of you who distribute gas under such conditions must contend with the possibility of its presence and be prepared to protect your property from it in the best manner possible.

The significant thing, and the tie-in between electrolysis and pipe coatings, is the trend toward a decreased use of coatings wherever we encounter the presence of or future possibility of electrolysis. Possibly many of you do not agree with this statement and if there are any coating manufacturers here they undoubtedly do not share our views. We have no quarrel with anyone who thinks not as we do; we are merely stating the essence of our own experience and our own conclusions.

You may argue that the obvious thing to do when circumstances of this nature are encountered is to remove the source of current or cause it to flow along the line to points where it may be drained off and conducted back to the power house. It is not our purpose here to discuss at great length the many ramifications of electrolysis mitigation but we take the liberty of digressing for a few moments to review some of the complications in such an undertaking.

From the standpoint of the electrolysis engineer there are two types of distribution systems. One of them is electrically continuous, that is, no great resistance is offered to the flow of current at any given point in the line. The other is, for the most part, electrically discontinuous, that is, there are interposed either by design or accident high resistances here and there along the line usually at the joints. In those systems which are largely of cast iron, except where the newer mechanical joints are found, it is probable that the joints do not interpose high resistances because of the lead calking usually employed in making them tight.

Every effort is made in such systems to keep the resistance low and in many cases jumpers are welded or otherwise fastened across the joint. In systems where the mechanical or dresser type of coupling predominates, the joint resistance is usually found to be quite high because of the rubber gaskets employed. This type of joint may be made completely insulating if a sleeved rubber gasket is used in place of the usual rubber gasket. Such couplings are called insulating couplings.

There are two schools of practice in protecting a system of mains and services from electrolytical action and these schools are probably as far apart as the poles. Whether a system should be deliberately maintained in a state of electrical continuity or one of electrical discontinuity is a highly controversial subject and we make no attempt here to tell you which practice should be followed. Each has its advantages and disadvantages and is dependent upon a great many considerations.

In an electrically continuous system every effort is made to maintain the electrical potential between two structures as nearly uniform as possible and the current which collects is encouraged to flow to designated points where it is collected in drainage cables and returned to the power house. This calls for considerable vigilance to discover areas of sharp potential gradients which must be reduced or eliminated through the use of jumpers across high resistance joints, the liberal use of drainage connections and the adjustment of resistances on these connections.

### Cathodic Protection

Cathodic protection is being used with considerable success on a number of pipe lines and in a few cities, particularly New Orleans. In the writer's opinion it is doubtful whether this form of protection can be used as successfully or in as large a measure in cities as it can in suburban areas or through open country. Wherever it is contemplated as a protective measure, serious consideration should be given to its effects upon other subsurface networks and to its cost in comparison with other forms of protection. The resistivity of the coating, the type of joint, the number and location of other structures which might be affected, the cost of current, the cost of pavement breaking and re-lying must all be considered.

We have been, so far, rather vague and indefinite as to the measures which may be taken by a distribution man in protecting his system against failures in areas where he knows stray currents exist and/or in which the soil is known to be corrosive or non-corrosive. Perhaps a few words about the practice followed by the East Ohio Gas Company will be of some assistance to others having similar problems or who are becoming conscious of the fact that protective measures of some sort will soon be imperative. Because of 30 years' experience with a steel system we have had the opportunity to rough out the boundaries of those areas where pipe replacements have been high but in comparison with other cities built on more corrosive soils our corrosion problem is not exceptionally serious. Nevertheless, we have for the past 20 years coated many of our new mains and most of our services with a hot application of reinforced asphalt, feeling that such a coating was good insurance and worth its cost.

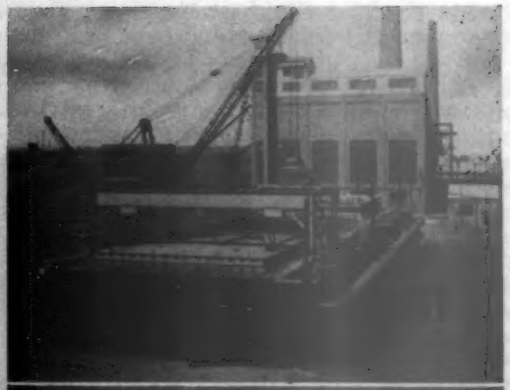
We are still of that opinion but in the light of more recent knowledge of the performance of coatings we avoid their use in any locality where a preceding electrolysis survey indicates the presence of, or future possibility of, electrolysis. Suppose for example that we are contemplating laying a new line as a link in our intermediate pressure system. Such a line will in all probability traverse several thoroughfares, cross several streets carrying car tracks, run parallel to or across several duct systems owned by other utilities. After the right-of-way has been tentatively chosen a complete electrolysis survey is made over its entire length.

In this survey milli-voltmeter readings are taken between all of the other systems found along the route, that is, from rail to water, rail to cable sheath, rail to rail, water to cable sheath; in fact differences in potential are determined between all dissimilar existing metallic structures. In many cases earth-current meter readings are taken and the direction and magnitude of the current flow is plotted. An electrical potential map is constructed for each point of the right-of-way where the line is to cross or parallel any structure which may pick up current from it or discharge current to it.

In addition to the electrolysis survey a soil survey is made essentially as described by Dr. Ewing. Using these surveys as a basis for specifications, detailed instructions are is-

(*Continued on page 57*)

PURIFIERS CONDENSERS HOLDERS COMPLETE PLANTS



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# Modern Advertising for Sales

By

**George Ketchum**

President, Ketchum, MacLeod & Grove, Inc. Pittsburgh, Pa.

MY thanks, first, to the program committee for choosing this title. The audience may condemn the committee's choice of a speaker, but the speaker is properly grateful for a topic broad enough to warrant thoughtful discussion, and yet sufficiently restricted to keep that discussion on a straight and direct line.

Since we are to talk about advertising for sales, we automatically exclude all the other kinds of advertising that gas companies have to do at one time or another—the institutional advertising, the good-will advertising, the advertising about legislation or taxation or franchises or public ownership. All these forms of advertising may be good, in their proper place; many of them, unfortunately, are necessary in these troubled times; but none of them have as their main errand the selling of gas or gas appliances. And that's our subject today.

This industry is suffering from several major ailments and a host of minor afflictions—merely to catalog them is to sound like a Jeremiah or a Cassandra. But it has been well said, by better and more experienced men than your present speaker, that nearly all these difficulties can be overcome by better selling; that every other problem of the industry pales into insignificance as compared with the need for sales.

If there ever was an easy-money period for natural gas, certainly that time has gone. Here is an industry with a huge investment, with distressingly slow turnover of capital; an industry whose plant capacity is far greater than existing demand; whose cost of operation is mounting with higher wages, material costs, taxes; whose selling prices are moving downward; an industry hampered and hamstrung by legislative threat; an industry with increasingly aggressive competition. It is an industry, too, whose market population tends to be static, so its salvation must come from more sales per customer, instead of relying, as others can, on finding new customers. And, like all business today, it must make its sales to a population whose spending power is still below par, and consequently the competition for the buyer's dollar is keener than ever in our memory.

A disturbing picture, to be sure; yet it is a familiar picture and one which has not unduly frightened the industry. Gas men know that something can be done about it, and they will do it; as did Foch, when he said: "My right is driven in, my left is broken, my center is shattered; I shall advance all along the line." Or, following the lead of another historical figure who is more nearly local, we shall imitate Br'er Rabbit, who climbed the tree—contrary to all natural history—just because he *had* to climb it.

## Mass Sales

If our platform is sales, and more sales, then advertising must be one of the principal planks in that platform. For advertising is most essential, most valuable, to an industry which—like ours—has a mass market with a low average unit of purchase, a market in which the more profitable groups of prospects must be searched out and isolated before the greater expense of personal selling is undertaken.

In this program of improvement there are three sets of responsibilities; three jobs to be done. Of these, the advertising man's job comes last; and since the success of his performance will depend in large part on the way in which the other assignments are carried out, I am listing some of the things which may be regarded as prerequisites to maximum profits from advertising expenditure and effort.

First in order are those responsibilities which belong to general management—things which should be done to provide the atmosphere most conducive to sales and advertising accomplishment. General management, I believe, should:

Give increasing consideration to sales departments and their problems; see that their personnel is adequate in numbers and in talent; give them every possible support.

Get rid of at least a portion of the conservatism which is a characteristic of this industry.

Do everything possible (if it is not already done) to hold down product costs, so that the selling job may be easier and more profitable.

Train all employes to do a better job in dealing with the public, so that a thoughtless meter-reader or collector won't undo in a few minutes the effort of weeks on the part of a salesman, and so that the salesman can operate against a background of general good-will and friendliness.

All of us are supposed to produce results from appropriations entrusted to us; we owe it to our superiors as well as to ourselves to make clear the proper function of advertising and the conditions under which it will work best.

First thing of all, of course, is for us to know all about the sales program into which our advertising must fit. We must know just what we have to sell; what are its faults and shortcomings, as well as its virtues; what is our competition, and our competitors' advantages and disadvantages. Most of all, we must know the market, the people who comprise it, their needs, their likes, their dislikes, and—without fail—their ability to buy the varied services we have to offer. We can't do our job well unless we know these things; yet how much of our present knowledge is based on guess work or opinion rather than on accurate investigation? It may be worth a lot to us to get out in the field and see whether we really know what we think we know.

Once we have these fundamental facts, advertising that sells comes easier. To be all the more certain

that it *will* sell, there are some specific do's and don'ts that we ought to observe. All of them are familiar, I think, to all of us; but perhaps it will do no harm to check them over and see whether we have been neglecting any of them.

### Proper Appeal

We must advertise in the customer's language, not our own. Let's not waste time or space on a description of gas, or on the "far-flung system of production and distribution," or on the fact that a lot of men work hard to get gas through to the customer. He knows we do these things only to make sales possible, and at best such talk simply distracts his attention.

Our advertising should be as interesting, as vivid, as dramatic, as possible. Some think natural gas lacks romance or glamour. I believe gas advertising often lacks these qualities; but that's the fault of the advertising rather than the product. "There are no uninteresting subjects."

We needn't worry about gas being impalpable and intangible; it's the intangibles that make people buy. Some gas advertising has been doing a good job of selling the intangibles of comfort and cleanliness and leisure and social prestige; all of it should.

Our advertising should be as aggressive, and hard-hitting as we expect a salesman to be. In good taste, of course; again just as a good salesman would be. In good humor, too; some of the best gas advertising has been written in humorous style. It's a great improvement over the stuffed shirt period, when the utilities tried to outdo the banks in conservatism and dignity.

We can keep on learning from the mail order houses and the department stores—two types of advertisers who make a point of knowing whether advertising produces, and how much. Macy's and Sears, Roebuck try to do a good-will job in their advertising, but they do it right in company with the most direct kind of selling.

We ought to analyze every advertisement carefully, in advance, to see whether it will be both interesting and clearly understandable to the average reader. I don't mean to waste your time talking about the twelve-year-old intelligence of the American public. I mean rather to point out that the ordinary citizen is chiefly concerned with his own affairs, and won't take time with an ad that isn't written so that he who runs may read. We must get the common touch into our advertising, if we want it to sell.

This industry has service facilities that are second to none. I don't believe we advertising men capitalize them enough as an aid to sales. We ought to give more emphasis to these day-and-night, year-round services that are so valuable an accompaniment of every order we sell.

I believe, too, we take too much for granted the ordinary customer's familiarity with gas appliances. I'm convinced, for instance, that most women don't know enough about proper handling of gas ranges. Maybe if we were careful to tell them, the electric range wouldn't be so much of a threat.

Wherever possible, we must keep prices, terms, and other conditions of sales, right up front. Sometimes it can't be done, I know; but every interested prospect wants to know what it costs, and it ought to be made easy for him to find out.

Economy is a word that finds its way into much gas advertising, and rightly so. We have suffered too long from the general impression that gas is a luxury item, yet we have plenty to talk about from an economy standpoint. Until Huey Long gets the wealth uniformly distributed, most of our people will be on low income levels—levels where even a few cents' saving is important. It isn't enough to assure our prospects that we have what they want; we know, for instance, that everyone would use gas for house heating if he had the price.

So far as we can, let's see to it that our advertising plans take the dealer into account. Every additional outlet for gas appliances means just that much added load on our lines.

### More Promotion Work

We must do everything possible, too, to encourage more advertising and promotion by manufacturers and by dealers. One of the handicaps of our industry is the lack of large-scale national advertising. If we can't remedy that, at least let us stimulate more advertising in our local territories by other factors in the industry.

Nearly every company has lost valuable business during recent years. Some of these customers wouldn't have left us if they had been followed up properly in the first place. Don't forget that a customer who has quit is the hardest one to sell. Be sure of an adequate advertising follow-up on our best customers in the future; advertising that keeps after the house heating customer, or the industrial or commercial customer, and keeps him sold.

Use coupons and other methods of testing advertising. Of course, in a business like this, coupons aren't the only standard of advertising success. But they can be used, in part, to measure one advertising medium and one advertisement against another; and they are especially valuable as a means of locating prospects for individual gas services. In our 1934 house heating campaign in the Pittsburgh district, 40% of the sales could be traced back to advertising.

The testimonial is still the most effective form of advertising. We can use it profitably, on many occasions. One of its intrinsic merits is that it talks of real people; preferably, for our purposes, it should talk of ordinary people and of ordinary uses of gas. Blue Book names and pictures are bad; they revive the old fallacy that gas is only for the rich.

We should select advertising media carefully, for maximum economy and effectiveness. If we can develop accurate prospect lists, as for industrial and commercial selling, we should use direct advertising to reach them. General media, such as newspapers, radio and outdoor, should be utilized for mass appeal and for isolating individual prospects. Let's not scatter our shots, and let's avoid buying junk; let's be sure we are doing a good job in one direction before turning to another.

One of the oldest arguments in advertising has to do with continuity. Continuity is desirable, but it is far better to do a few concentrated jobs than to carry on a skimpy year-round program. We must be sure our advertisements are big enough to be seen, and strong enough to be remembered. We have a big story to tell, and a big market to tell it to; be sure we put it up in a package that does justice to the product.

Finally, now that we have made certain that our advertising is perfect, be equally sure that our companies take full advantage of it. See that the sales department, and every salesman in it, know about the advertising program and tie it into their activities. See that it is properly merchandised to dealers. See that the management, which has authorized this expenditure—which, if our prayers have been heeded, has authorized *increased* expenditure—knows what the advertising is intended to do, and what it does. And, for our own conscience sake, be sure that we can prove to ourselves that this is advertising that *sells*.

# Safety Pilots—Their Design and Performance

By
J. A. LEIGHTON
American Gas Association Testing Laboratory

*(Continued from April issue)*

Having described briefly several principles employed in the design of devices to prevent escape of unburned gas, the balance of the discussion will be devoted primarily to their performance characteristics. A safety device should perform the following functions:

### Operation

1. Operate to shut off the gas supply to the appliance without delay in case; (a) the means for igniting the gas has been extinguished or otherwise rendered inoperative, (b) the flame or other means keeping the valve open becomes extinguished or otherwise inoperative, or (c) current fails where the valve is of the electrically operated type.
2. Operate to turn on the gas supply without delay after the pilot has been lighted and means of ignition have been established.
3. Be of sufficient capacity in the open position to pass an adequate quantity of gas of any reasonable heating value and specific gravity.
4. Be so designed and assembled that it will not leak gas under any conditions.
5. Operate to close off the gas supply, etc., without being adversely affected by remaining in the open position for an extended period of time.
6. Withstand without failure or faulty performance a reasonable number of operating cycles.
7. Be durable and serviceable, easily cleaned and not readily susceptible to corrosion, etc.

The above optimum characteristics are sometimes difficult to obtain in practice because of definite mechanical limitations and the degree of flexibility required which arises from the many different conditions under which appurtenances of this type are called upon to operate.

The last obstacle, which is so intimately related to the application of accessories of this nature to an appliance, is also a handicap in preparing standards which will insure their safe and satisfactory performance under all circumstances. It is entirely feasible, however, to devise a series of tests of a comparative nature which simulate actual operating conditions which, when properly applied, give a reliable criterion of the ability of the device to operate satisfactorily in service assuming that it is correctly installed.

Despite the fact that these devices are designed to prevent the escape of unburned gas from the main burner, actually their action rarely depends directly on the main burner flames. *The safety feature arises from the fact that equipment of this nature* shuts off the gas supply unless means are available for igniting it at the burner. This conception of the performance of safety devices is often not fully appreciated. Adequate and properly functioning means of ignition, either incorporated as a part of the devices, or provided separately on the appliance are, therefore, an essential adjunct. Whether the pilot actuating the device and the burner ignition pilot are the same or separate units, means should be available for igniting the gas at the burner under all circumstances.

Where a gas pilot of the device is also the ignition pilot it is comparatively simple to insure satisfactory lighting of the main burner gas and simultaneously insure automatic safety control. Except for certain types of accessories, however, such a system involves placing the thermal element in, or close to, the combustion chamber with attendant difficulties of protecting it from heat which adversely affects its performance. These difficulties may be overcome by employing an automatic pilot, the function of which is not affected by combustion chamber temperatures. A more common arrangement is to have a constant burning pilot actuating the device and a separate pilot to insure ignition. When such a system is employed, adequate provision must be made to insure that whenever the pilot holding the valve of the safety device open is operating, the ignition pilot is also prepared to function. Effective flame travel between the actuating and the ignition pilot must accordingly be provided. Incidentally, this flame travel must be infallible and positive even under conditions of low gas pressure where the flame of the actuating pilot is only just sufficient to hold the main gas valve open. Such devices should be tested for flame travel, gas pressure variations, and draft effect before they are considered as satisfactory. It should also be kept in mind that the gas consumption necessary to attain and maintain good flame travel should be within reasonable limits.

### Time of Operation

One of the most important characteristics of equipment of the nature discussed is its time of operation. This refers to both the time interval required for the device to close off the gas supply when the flame holding the valve of the device open has become extinguished, and that required for the device to open the valve when it is placed in operation, although of course the former is the more significant. The period of time required for a properly adjusted device to shut off the gas supply after the flame actuating the device has become extinguished depends principally on the temperature surrounding the thermal element; however, certain types of these devices are so designed as to be largely immune from the effects of the surrounding temperature. In high temperature combustion chambers, obviously, the temperature differential between the thermal element and the compartment is apt to be relatively small with the result that the time of closing is delayed. Any other source of heat would also have a retarding effect on the operation of the device. It is to be noted in this connection that the source of heat may be the result of either conduction, radiation or convection. These facts should be kept in mind in installation.

Time of operation of the valve also is dependent on the conductivity and heat retaining properties of the thermal element. Thus, to consider an extreme condition, if a large bulk

metal of low conductivity were used for the thermal element, it is obvious that the action of the device would be sluggish. It would not possess "sensitivity" or a quick response to small changes in temperature. While a sufficient quantity of metal is desirable to insure durability and to minimize effects of corrosion or sustained heating, proper alloys are now available to secure strength and resistivity without employing heavily constructed parts which sacrifice sensitivity. Consideration of this principle becomes more applicable as a precaution in completely mechanical types than for those devices designed to operate a valve mechanism through an auxiliary power supply by control of an electric switch, since the magnitude of the required motion in the latter type does not need to be very large.

In mechanical devices, a method of minimizing the retarding effect of heat content of the device, and also of reducing the valve motion required to accomplish opening and closing is to increase the valve diameter. This provides a sufficient capacity with a minimum of valve travel. Possibilities along this line are limited to some extent, however, by the costs involved.

Methods of heat application to certain types of thermal elements are also important from the standpoint of operating time. If the heat intensity is too great the temperature of the element may be far in excess of that required to hold the valve open with the result that the time necessary to cool the device to its operating range is correspondingly increased. Careful design and intelligent installation and adjustment will minimize troubles from this source. At least one type of device on the market is equipped with automatic means to prevent overheating of the element. A pilot control is incorporated in the body of the device and utilizes a dual valve combination and two pilots, one constant burning, and the other to heat the thermal element. The temperature of the element is just sufficient to hold the valve open and is maintained in this balanced condition automatically.

### Fatigue of Thermal Elements

Although comparatively little information seems to be available on the subject of metallic fatigue of thermal elements under influence of heat, it is known that several metals and alloys are apt to undergo a permanent set above temperatures of 1200 degrees Fahrenheit. Probably this phenomenon also occurs to a slight degree at lower temperatures. Intense heating of an element is therefore also undesirable from this point of view. From an economical standpoint also it is preferable that pilot gas consumption be maintained at the lowest practical rate.

On the other hand, supply of heat to the thermal element must naturally be sufficient to keep the device open. This precaution becomes significant when the effects of chimney drafts and normal air circulation as well as changes in city gas supply pressures are considered. If a small or particularly an unprotected flame is employed to actuate the thermal element, it is susceptible to drafts. Instances have occurred where normal drafts have blown pilot flames away from elements and caused shut-off of the main gas supply although the ignition means were operating properly. This condition is largely a function of the method of installation and the appliance design and should be kept in mind if service calls and complaints are to be minimized. It is desirable that protective means against action of drafts be incorporated in the design of safety devices. Rough check tests may be conducted on the stability of pilot flames of protective contrivances by means of an ordinary fan.

Relative positions of the pilot flame and element, as well as pilot flame characteristics may also have a bearing on the time of operation. Where flames impinge directly on the element there is a tendency for carbon deposits to form. This is particularly true of luminous flame constant burning pilots and will also result from improperly adjusted or fouled Bunsen pilot flames. Such deposits act very effectively as an insulator and will delay responses of elements to temperature changes with subsequent retardation of the operating time, and may even result in uncalled for shut-off.

### Time Limit 5 Minutes

Tests conducted over a period of several years by the American Gas Association Testing Laboratory have shown that the maximum permissible time for automatic safety devices operating under room temperatures to close off the gas supply, should not exceed 5 minutes. This permissible time limit was selected as being consistent with the actual ability of several samples of some 20 different devices tested, to operate within this time limit under the conditions noted. A maximum limit of 5 minutes is not, of course, an optimum and as might be expected, 75 per cent of the devices tested operated in 2.5 minutes or less. Considering the present stage of development of these devices, however, the committees considered that a more stringent allowable limit might tend to discourage further development and retard progress. Furthermore, all of the devices which were tested in arriving at the above tolerance were giving satisfactory service in actual use and it seemed that a more rigid requirement at present would unjustly penalize the manufacturers of some of these accessories. Still further, increased speed in operation is often made at the sacrifice of ruggedness and durability; consequently, a balance between these factors and the time of operation was considered desirable.

The room temperature specified for this test in the American Standard Listing Requirements is 75 degrees Fahrenheit plus or minus 5 degrees. This temperature was selected for the reasons that: (1) there is no standard temperature at which devices may be called upon to operate since temperature conditions vary with each installation; (2) a large number of tests at temperatures from 350 to 600 degrees gave no better indices of performance than room temperature tests; and (3) tests at room temperature simplify the Laboratory procedure and tend to keep down the costs of tests to manufacturers.

Thermostatic pilots supplied on gas appliances submitted to the Association's Laboratory for approval are, of course, subjected to the various performance requirements at actual temperature conditions under which they will be required to operate in service. Check tests of this nature should always be made on such accessories after they have been installed since their method of application may have a bearing on their performance. The listing requirements referred to herein, and applied to separate devices, are extremely comprehensive and safety devices tested and found to comply with them will perform satisfactorily on appliances if the proper type for the particular job is selected and its installation is properly made.

### Operation of Safety Devices

Many safety devices are provided with means of adjusting the operating time. A common fault of many of these adjustable features is that in decreasing the time of operation on the closing cycle, the time of opening is often correspondingly increased. This may be compensated for by manual features which permit rapid heating of the element by increasing the gas rate to the actuating pilot. Devices which are designed to operate each time the main burner

which they control is turned on or off are fully automatic and do not readily lend themselves to manual acceleration. Adjustments in this class of devices also usually increase the time of operation to open in proportion to the reduction in the closing time interval. Since no hazard is involved during the opening cycle the time limit for placing the device in operation is essentially determined by time of operation to close. Inconveniences to consumers will result, however, if too long a period is required for devices to turn on the main gas supply. For most purposes these two factors may be compromised by requiring that automatically opening devices shall not exceed 10 minutes to turn on. For devices which must be held open manually until the main gas supply comes on, however, the maximum time should be limited to 2 minutes.

Constancy of time intervals necessary for opening and closing of these devices should remain reasonably close. Consideration of the practical aspects of requiring absolute check of time intervals for operation will, however, justify an allowable deviation of plus or minus 1 minute provided the total time does not exceed the operating limits previously established.

Another important characteristic of an automatic device designed to prevent escape of unburned gas is its ability to pass a sufficient quantity of gas. In order to allow a factor of safety in a test of this kind which will take into account the various kinds of gases distributed, line pressure variations, and pressure drop in the device, and in service piping, it is desirable to make this test with a low Btu, high specific gravity gas. For purpose of comparison of several devices it is desirable that all results be expressed on the basis of one gas. If a sufficiently "slow" gas is not available, results obtained with any given gas of known heating value and specific gravity may, for comparative purposes, be computed in terms of such a gas. This is accomplished by recognizing that flow of a gas is directly proportional to the square root of its pressure and inversely proportional to the square root of its specific gravity. Our Laboratory utilizes such a method by using an arbitrarily selected standard gas of 500 Btu and 0.60 specific gravity. All capacity test results are computed in terms of this gas, although actual tests may have been run on air. Capacity of the device is that determined by the quantity of standard gas which can be passed through its normally opened valve at a differential pressure equivalent to a 0.5 inch water column.*

An A.G.A. Laboratory Testing Room

Neither the body nor valve of these devices should leak gas. While this requirement seems obvious, it should be remembered that manufacture of these devices on a production scale prohibits precise machining of valve parts with the result that a slight leakage of gas may occur in some cases around the valve when it is in the normal closed position. Such leakage should, however, be limited to the neighborhood of 0.1 cubic foot per hour or less under a test pressure equivalent to a 1 inch column of mercury. This requirement is within the limits of accuracy of manufacturing processes and the quantity of gas is not sufficient to constitute a hazard, providing due consideration is given the general types of appliance on which such an accessory may be installed. No leakage should be allowed through the body or surface junctions of the assembly when a 1 inch mercury column pressure is applied, however. This test may be made with the outlet of the device closed and the valve open, pressure being applied at the inlet.

### Mercury Column Test

The American Gas Association in its test for certification of automatic devices for listing employs a mercury column drop method in examining these devices for leakage. No drop in the mercury column is permitted when bodies of valves are tested for leakage. Limits of drop in pressure under 1 inch mercury pressure have been established for a given test apparatus when conducting leakage tests to determine the tightness of the fit between the valve and its seat. For convenience, air is used for test purposes although gas may be employed.

Depending on the manner in which automatic safety devices are used, they may be called upon to operate every time gas to the appliance is turned on and off; or only in an emergency. Those that operate only in an emergency obviously are not readily susceptible to wear nor will faulty operation arise from this source as a general rule. However, such a device might possibly fail to operate due to sticking or freezing of parts of the mechanism as a result of being maintained in one position for long durations of time, as long as six months or more under certain circumstances not being uncommon. From a laboratory viewpoint it would obviously be impractical to attempt to conduct life tests simulating exactly conditions of service. Barring such failures as might result from corrosion or oxidation which are functions of the materials used in construction of the device, it seems reasonable to suppose that a fairly reliable indication of ability to perform satisfactorily after a period of continued service would be obtained by a test over a thirty day period. From the standpoint of simulating actual conditions this period is a minimum. An intelligent examination of the device after 720

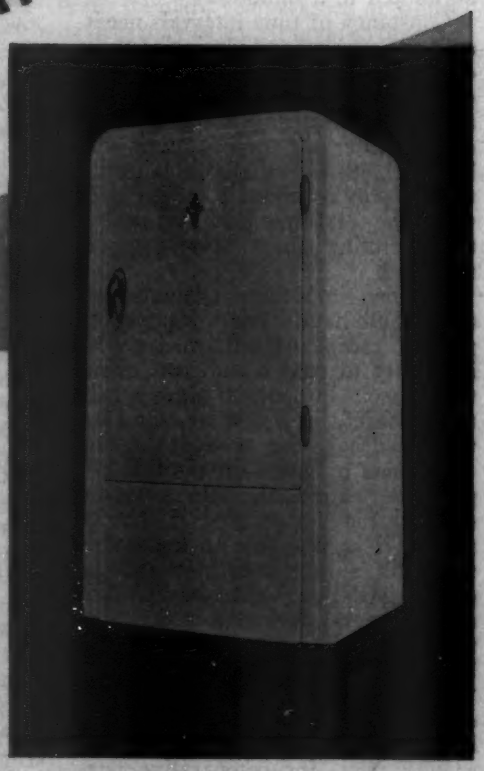
*(Continued on page 62)*

** Details concerning the test method and equipment may be obtained by writing to the American Gas Association Testing Laboratory.*

WITH AN ENVIABLE RECORD IN THE PAST—

# Philadelphia

# ALREADY 142% AHEAD IN GAS REFRIGERATION SALES



USES NO WATER

PHILADELPHIA gas men are at it again—*breaking records!* Each year for the past three years, they've beaten their own previous record by a generous margin. Now they're out to do it in 1935!

During the first quarter of this year, gas refrigeration sales by Philadelphia Gas Works salesmen *more than doubled* those for the same period in 1934. And "open season" on refrigerator prospects has just begun!

### Aggressive Selling

What is the secret of Philadelphia's sales success? One important reason is aggressive, intelligently directed selling. The sales force consists of specialty salesmen who sell refrigerators only. And this year, as an additional incentive to good salesmanship, Philadelphia Gas Works have instituted the Quintuplet Club. Membership in this club is a high honor, and goes only to those salesmen with outstanding sales accomplishment. Already, 43 Philadelphia gas men have brought in multiple sales in a single day; some making as many as 5 individual retail sales as result of one day's work.

### Product Superiority

It is such aggressive selling as this—*plus* the vital competitive advantages of gas refrigeration—that account for Philadelphia's remarkable sales achievement. The new 1935 Air-Cooled Electrolux is easier than ever to sell. It is years ahead in beauty, as it has always been ahead in performance. The 1935 Electrolux offers every gas company a product which it can be proud to offer to its customers. By putting definite sales effort behind Electrolux you can make sure that the refrigerators installed in your territory are *gas* refrigerators! For *1935 is gas refrigeration's year.* Plan now for aggressive gas refrigeration selling during the coming months! Servel, Inc., Electrolux Refrigerator Sales Division, Evansville, Indiana.

NEW *Air-Cooled*
ELECTROLUX
THE SERVEL *Gas* REFRIGERATOR

REMEMBER: 1935 IS GAS REFRIGERATION'S YEAR!

# Play Up Gas Water Heating in Your Windows This Summer

**by Stuart Bratesman**

Manager, Display Dept.
Boston Consolidated Gas Co.

DURING the hot summer months, which are just around the corner, it is a good merchandising plan to feature the advantages of automatic gas water heating in your window displays. People take more baths in summer due to the heat; this, in turn, focuses attention on method of heating the water, which makes every person who has an inadequate system a prospect for a new gas water heater.

Reach these hundreds of potential gas users with a planned campaign of intelligent window displays. As they hurry by your building, tell them the story of low cost hot water, with gas. Make your messages simple and direct. Don't confuse the reader with too many facts at once; limit the copy to something human and arresting, then let the salesman explain the details. The big job of your window is, or should be, to arrest people's attention as to the advantages of gas and modern gas appliances.

Accompanying these lines are three gas water heating window display sets that are ideal for summer windows. To acquaint the reader with the construction and preparation of material of this type, I am taking a few lines to set down the details of each piece.

The display captioned, "Bathe in a jiffy," was painted in tempera water colors on wallboard sections, which were braced from behind with light pine frames. The young lady powdering her shoulder was in flesh colors and browns, against an area of light green. The "L" section holding this painting was in orange with white and black lettering. A row of hidden trench lights added a bit of effectiveness to this display. These lights were installed behind the lettering section and illuminated the illustration in a light frame.

To make the figure of the girl hurrying home actually stand out from the background section, it was cut out and mounted ahead of this plane. The back figures were painted in light magentas on a white ground. Black lettering on a turquoise blue circle brought the eye to the body copy, which was mounted on an area of light cream.

No actual water heater was used with the child health display, but a photographic enlargement was mounted and included in the design. The little girl's head in this set was cut out, painted in bright greens and mounted away from the back yellow section. Hidden lights behind this head gave a startling halo effect, especially at night. The headline and body copy was in orange on black areas, with the last small paragraph in light yellow.

I trust I have not burdened the reader with too much technical detail, but it has been suggested that gas company officials might like to learn of the method of construction and preparation of the window displays that are shown with this series of articles. At the risk of appearing monotonous, it is planned to include a little technical information with each future article.

This summer, spend a little time and money in a series of water heating displays. Feature this subject more than in the past, and remember, water heaters are perhaps the biggest load-builders we have. Give a little thought to them, right now!

# Show the line and Reap the Profit

You can please *every* customer when you show the complete line of American Gas Products for heating. There's a boiler or a convertor to suit every taste, every home, every job. For the man who wants a completely new installation — the Ideal Gas Fired Boiler, in whichever of its many sizes suits his requirements. For the man who wants a conversion burner, you've got the convertor tailored to his needs. Here is the line—show it and profit. Each is dependable, efficient, economical to operate. Each is fully automatic, all controls being centered in the AGP Throttling Gas Valve. Each is an item that's easily sold and that *stays* sold. For full particulars and details write today to

AMERICAN GAS PRODUCTS CORPORATION
DIVISION OF AMERICAN RADIATOR COMPANY
40 WEST 40TH STREET · NEW YORK, N.Y.

**HERE'S THE ANSWER TO EVERY GAS HEATING REQUIREMENT:**

**IDEAL GAS CONVERTOR** for the Arco Round Boiler or any round type boiler or furnace. For Natural Gas.

**REDFLASH GAS CONVERTOR**—Tailor made for the No. 1 series of Arco Redflash and similar boilers.

**AMERICAN GAS CONVERTOR** combines features never before incorporated as standard equipment in a burner. For Round Boilers.

**IDEAL GAS FIRED BOILER**—From the smallest to the world's largest, provide a size and type for every domestic and industrial need. The "Empire" Ideal illustrated above.

# "SUCCESSFUL SELLING"

## Employee Selling Increased Appliance Sales

**(An Interview with J. R. Cole, Operating Manager)**

GIVEN the proper inducement for sales effort, linemen and office girls sometimes make much better salesmen than trained specialty men of long experience.

Officials of the Southern Union Gas Company, operating thru affiliated Companies in about 40 towns and cities in New Mexico, Texas, Arkansas and Colorado, have reached that conclusion following a year of phenomenally successful contest selling in which all employees participated. During 1934, the group of Southern Union properties made a general meter connection increase of 12% and an even greater gain in number of appliances per connection. This takes in a great many very small towns where very little appliance business could normally be expected. The larger properties have made much greater increases than the general one.

The Albuquerque Natural Gas Company, at Santa Fe, New Mexico, one of the leaders in the contest selling, is a good example. From October, 1933, to October, 1934, this property made a meter installation gain of 22%. And, here is the appliance record for the various companies participating in this contest: one hot water heater to every 16 meters, one range to every 19 meters, one space heater to every 9 meters and one circulator to every 12 meters. In three months of 1934 the properties increased their total appliance sales 328%.

Every employee has been made a salesman—in that fact lies the answer to these remarkable gains. The plan was launched with a three month sales contest starting in July. This was followed by another of two and one-half months, beginning in September. A third one was launched early in March, 1935, and it promises to be even more successful than the other two. For instance, the morning the third drive was launched at Santa Fe, employees were asked to "push" a combination sale on a cooker, a piping job and a hot water heater. Within two and one-half hours after the announcement was made, 26 jobs had been brought in.

Merchandise prizes were offered in the first instance and $1,000.00 in cash prizes in the second. The cash gained the most interest. The prizes in the first contest ranged from a trip to the World's Fair down to wrist watches. The cash arrangement, which is being repeated with the latest contest, is more effective because everybody is assured of some compensation for his efforts. The employees are paid for making the original contact with the purchaser. The actual closing of the sale, in most cases, is left to the salesmen. Under this plan, the total number of points made by all employees of the various properties is divided into the amount of prize money to determine the cash value of a point. Then, each person is paid in cash according to his number of points.

A hypothetical example best illustrates the idea. Suppose a total of 10,000 points are made and the prize amounts to $1,000.00. This makes each point worth 10 cents. If an employee has 300 points, his prize is $30.00.

A definite schedule of points based on the load building value of each appliance, is set up as a basis. The schedule used in the current contest illustrates this. New meters, 10 points; meters reconnected after being out of service six months or longer, 6 points; unit heaters, four points; central furnaces, four points; conversion burners, four points; water heaters, three points; circulators three points; radiators, three points; floor furnaces, three points; ranges, three points; refrigerators, three points; space heaters, two points; laundry stoves, two points; and miscellaneous, two points.

### Girls and Linemen Sell Most

The contest brought forth a series of surprises. One was that in many cases the office girls and linemen far outsold long experienced salesmen. A girl was the winner of the grand prize in the first contest. WHY? Simply because these people worked their friends and acquaintances in an unusually consistent manner. They became thoroughly sales-minded and transmitted their enthusiasm to everybody they knew. Their type of selling may be likened to the methods used by some of the most successful insurance men—that based on friendship rather than "high-pressure" effort. With every employee contacting his group of friends, the company gained an entree to numbers of places which couldn't ordinarily be reached.

Some idea of the enthusiasm created among normally non-selling employees may be had from this fact. The employees of one property voluntarily organized into rival teams, the loser to buy the other group a dinner. While all of them were working together for a common end, they were competing against each other in a spirit of friendly rivalry—a spirit that meant added sales.

Even the outside public took up this interest. In one town a utility employee gained the support of a druggist friend so completely that he sold for the employee, 10 floor furnaces. This druggist had an installation in his own home and he made a business of inviting friends in to see it and selling them on the idea.

In several cities, supplies of progress bulletins—issued by the home office for the purpose of stimulating employee interest—were exhausted by public requests for them. Numbers of people came into the offices every week and asked for copies to see how their friends were progressing in standings.

This public interest was further stimulated by the Santa Fe property through organization by the employees of a baseball team. The team offered to play all comers—and through the contacts thus established sold a lot of appliances and gained an unlimited amount of interest.

Care has been taken with all the contests to keep the periods short enough to maintain the interest of the employees and the public alike.

In a 90 day period, no one person is likely to get so far ahead that the others lose heart and quit trying.

**People Like the Man in Overalls**

While the friendship element was highly important, another more subtle psychological factor came into the success of linemen and other similar employees. Many people would listen to "a man in overalls" where they wouldn't grant an audience to the specialty salesman. They had confidence in linemen and they were interested in seeing them get ahead in the competition.

Repetition also played a part. When as many as seven or eight different people talked to a potential user on appliances, he began to "sit up and take notice." Even if he didn't buy at the time, an impression was made which will be valuable later.

Although load building has been the main consideration in this drive, the importance of quality in appliances sold hasn't been overlooked. In a majority of cases, only the best approved equipment has been installed. By allowing reasonable payment periods, it was possible to sell people on merchandise that will last.

# SELLING HOT WATER BY THE GALLON

## Customer Pays for Water Used Instead of Gas and Electricity

By
**Ralph N. Hill**
Vice-President Green Mountain Power Corporation

FOR more than a year the Green Mountain Power Corporation has been experimenting with a new method of selling gas and electricity for water heating.

We have hesitated to make any positive statements about this plan until several installations were made to establish definite indications.

Now, with over 100 gas and 35 electric installations in use, and not a single high bill complaint made by any customer using this service, we feel safe in telling the story of selling gas and electricity for water heating by metering the water.

Briefly, our plan consists of selling water heating service by metering and billing the hot water used by the customer instead of the gas or electricity used for heating the water. The plan is novel, and novelty may be an aid in selling a customer, but something more substantial is required to keep him sold and have him pay his bills without protest.

For several years previous to the development of this "by-the-gallon" rate we, like most companies, had struggled to sell water heating on a combination cooking and water heating rate, which seemed quite favorable to the customer. There had been sold about 140 automatic gas heaters which we thought were still on our mains, but a check-up disclosed that more than 25 per cent were not in use and still others were used only through the summer or as auxiliaries to furnace coils or other methods of water heating.

These facts led us to a study of the situation, from which we developed the following conclusions:

*First:* That the family use or waste of hot water grows continuously, particularly when a real continuous controlled temperature service replaces indifferent and limited service. The customer is unconscious of this increase and seldom believes that he uses half as much as he actually uses.

*Second:* That it is the fear of operating cost which prevents more widespread use of gas or electricity in heating water.

*Third:* That billing the heating service is so indirect a method, particularly when gas or electricity is also used for other purposes and registered by the same meter, that to translate the bill to gallons of water heated is difficult and confusing.

*Fourth:* That the extremes are so widely divergent that to estimate usage or averages is uncertain and misleading. To illustrate, we have on our metered plan a family of seven—four grown-ups and three children, who rarely use more than 500 gallons of hot water per month. We also have a family of two, a middle-aged man and wife, in a small house, who average nearly 3,000 gallons per month. Both customers are satisfied with the metered hot water rate, although we question if the larger user would be unless there was conclusive proof that he uses as much hot water as he does.

*Fifth:*. The purchase of cheap, poorly insulated, inefficient heating apparatus results in high bills and dissatisfied customers; a situation difficult to control when billing the service.

*Sixth:* That the Company needs, and the customer will pay a slightly higher price per gallon for the service that it is possible to furnish with automatic water heaters using gas or electricity.

*Seventh:* That gas or electricity used for water heating purposes offers advantages in perfectly controlled water temperature and adequacy of supply which cannot be provided by competing fuels.

We further concluded that it was possible to heat the amount of water required for ordinary household uses at a price customers would pay with a profitable return to the Company. This requires efficient heaters properly installed and adjusted and a means whereby the customer can himself determine the amount of hot water he uses and check the amount he wastes. We believe that if a customer is convinced that the unit cost of a commodity is reasonable he will, if he is convinced he is getting what he is paying for, either pay his bill without objection or use less hot water.

The rate now available to gas customers of the Green Mountain Power Corporation provides that sufficient gas will be supplied each month to heat 500 gallons of water to 140 degrees Fahrenheit for $2.50 and if more than 500 gallons per month are used the cost of gas will be increased at the rate of one cent for each five gallons of water.

A similar rate for electric water heating provides that sufficient electricity will be supplied to heat 400 gallons of water to 140 degrees Fahrenheit for $2.50 per month with increase of one cent for each four gallons above 400 gallons.

In both rates the Company reserves the right to operate the heaters on an off peak basis.

Two gas and three electric heaters have been approved for use under the rates.

We have used a special water meter registering standard U. S. gallons on a vertical scale and with a special impeller for hot water. The meter is installed on the cold water inlet to the tank, but should hot water back up through this meter it would not be damaged.

The average annual gross return per customer is about $50.00.

Reprinted from February Issue of "Contact" through courtesy of New England Power Engineering & Service Corp.

The rate is on a yearly contract basis, with a $2.50 monthly minimum.

Water heating with gas or electricity is the most nearly perfect service that can be furnished—clean, safe, requiring no customer attention, providing constant temperatures winter or summer, and for such service customers should be, and are, willing to pay a reasonable premium over and above the cost of less perfect service from competitive fuels. Nevertheless, we must convince them that the differential is not large, and that they get what they pay for. The "by-the-gallon" rate accomplishes these ends.

Over 100 gas and 35 electric water heaters installed during the past year on the per-gallon rate, without a single complaint of high bills or inadequate service, is our basis for claiming that the plan has merit.

## Oklahoma Natural Gas Company Sponsors Automatic Water Heater Campaign

**By M. L. Kapp**

THE Oklahoma Natural Gas Company, which supplies Natural Gas to 121,000 customers in Oklahoma, is now conducting a two months activity on Automatic Gas Water Heaters. At the end of the first campaign period of 30 days on March 31st, the gas company dealers had sold 314 Automatic Water Heaters.

This sale was termed the "Cleaner Spring Cleaning Campaign" and all employees of the operating and sales departments participated in obtaining prospects. A cash prize of $5.00 was paid to the employee in each of our eight districts who turned in the largest number of prospects that were actually sold a water heater and to the District Sales Manager of the leading district, a suit of clothes was awarded. At the end of the first 30 day sales period, our Shawnee, Oklahoma, district leads with 27 per cent of its total annual quota.

Cooperative advertising was used, tying in with the dealers to the point where a full page advertisement was run each Sunday in the larger towns and 24 inches each week in the small towns. Attractive window displays were used and the dealers were very active in explaining the advantages of Automatic Hot Water at our cooking schools which were held in 45 towns during March. Bill stuffers were also used explaining the advantage of a plentiful supply of hot water.

Our annual Sales Program calls for Automatic Water Heater Activities in March, April and September, and for these three month periods a total quota of 2,700 Heaters was set up. The first month's results show that 11.6 per cent of our total quota has already been sold, with April results still to be tabulated.

In Oklahoma, there is a State Law prohibiting utilities from merchandising and it was up to our Sales Department personnel to put this job over. We feel that it was very successful and the dealers are all high in their praise of our cooperation, especially to the advertising end. We believe that at least 400 additional automatic Water Heaters will be sold in April, which would make a total of some 700 heaters for the two months sales period.

I never dreamed it was possible...
... to own a Self-Operating Gas water heater for such a small cost!
SPECIAL OFFER
$3.00
See Your Dealer Now
Oklahoma Natural Gas Company

## Safety Pilots and Relief Devices to be Required on All A.G.A. Approved Gas Water Heaters

ALL A.G.A. approved automatic gas water heaters regardless of the date Testing Laboratory approval was granted, must now be supplied with automatic devices to prevent escape of unburned gas (safety pilots), and all A.G.A. approved storage type gas water heaters will soon be required to have means for relieving excessive stored water temperatures and pressures as regular equipment.

This important legislation was recently adopted by the American Standard Association Sectional Committee, Project Z21, A.G.A. Approval Requirements Committee, as a result of recommendations of its subcommittee on gas water heater approval standards.

The subcommittee's action regarding safety pilot requirements was taken partially upon the recommendation of the Gas Water Heater Institute, expressed in a resolution adopted by that organization in June, 1933.

The requirement making the use of safety pilots mandatory was made effective retroactively as of January 1, 1935, and as previously mentioned applies to A.G.A. approved gas water heaters whether approved any time before or after that date. This requirement does not, of course, apply to non-automatic water heaters.

The requirement necessitating use of means to limit both temperatures and pressures on all A.G.A. storage gas water heaters will become effective on July 1, 1935, and will, on and after that date, make the use of such equipment mandatory on all heaters of this type regardless of when they were approved. Storage type water heaters, for purposes of this requirement, are considered as being only those approved by the Laboratory with a storage tank as an integral part of the appliance. Incidentally it is to be noted that standard thermostats are not interpreted as being relief devices although satisfactory automatic gas shut-off valves actuated by storage water temperatures will meet that part of the requirement providing for temperature relief equipment. Means of relieving excessive pressures must, however, also be provided.

# MAGIC CHEF HEAVY DUTY

*Equipment for Modern Gas Cooking*

WITH its advanced design and new standards of greater efficiency, convenience and economy, Magic Chef Heavy Duty Automatic Equipment completely fulfills the requirements of modern gas cooking.

Purveyors of food to the public, including hotels, restaurants, cafeterias, lunch rooms, taverns, clubs, hospitals and institutions public and private, will be impressed by its many advanced features.

These features include perfect control of the gas flow provided by the famous Red Wheel Lorain Oven Regulator; extra heavy oven insulation for cooler, more comfortable kitchens; burners with wide range of heats; substantial saving of gas; modern streamline design with easy cleaning and sanitation; continuous cooking tops; more wholesome and delicious food because of more even and controlled heat; automatic lighting; speed, safety, dependability and durability.

Magic Chef Automatic Heavy Duty Equipment materially strengthens the important position of gas for cooking and gives added co-operation and support to the gas industry in its efforts to build and maintain the gas cooking load. An illustrated descriptive folder gives the complete details. If you haven't seen it, write for a copy.

**AMERICAN STOVE COMPANY**

*World's Largest Manufacturer of Gas Ranges*

BOSTON • NEW YORK • ATLANTA • CLEVELAND • CHICAGO
ST. LOUIS • PHILADELPHIA • SAN FRANCISCO • LOS ANGELES

LOOK FOR THE RED WHEEL WHEN YOU BUY A MAGIC CHEF

Magic Chef
AMERICAN STOVE COMPANY

# Comparative Advantages of the Modern Gas Range

By George L. Scofield

General Sales Manager, Dominion Natural Gas Co., Buffalo, N. Y.

**THESE comparisons were compiled for use in a recent successful 50 day range campaign conducted by the Dominion Republic Group, serving 77,000 customers, during which 620 modern gas ranges were sold.**

**An outstanding feature of the campaign was the prize contest for the best sales talk or letter on "Gas, The Ideal Fuel for Cooking and The Advantages of Today's Gas Range."**

**A $5.00 prize was awarded to the employe in each district whose letter was selected by the judges to be the best. Two of the winning sales talks are reproduced herewith.**

## MODERN GAS RANGE vs. OBSOLETE GAS RANGE

### Modern Gas Ranges Are More Attractive

THE more modern design and the attractive finish of "Today's Gas Ranges" make the kitchen a room of beauty as well as a practical one.

### Modern Gas Ranges Are More Convenient

1. Porcelain interior and exterior, porcelain burners, etc., result with little care in spotless and clean ranges.
2. Marvelous Oven Heat Regulator does the watching and maintains the exact temperature desired. It insures perfect baking results, minimum shrinkage of meats, and gives a woman greater freedom. So convenient is a modern gas range that it will cook an entire meal perfectly while Mrs. Customer is away shopping, playing bridge, etc., for the afternoon. Time arrangements also sound an alarm informing the cook that it is time to remove the cake, pies or other pastry, etc., from the oven.
3. Newly designed gas burner insures perfect combustion and absolutely no blackening of kettles.
4. Super Speed Burners bring top burner operations up to a quick boil—saves time.
5. Storage Compartments bring utensils handy to the cooking operations—saves steps, time, etc.
6. Table top designs are most convenient for warming dishes, preparation and serving of foods. Table top design also gives larger cooking top capacity.
7. Table top ranges are extremely popular and practical as they fit well and get the maximum of light in any kitchen. They are ideal for tenants who move frequently. Nearly 100% of the new stove sales in the U. S. A. are now of the table top design.
8. New type and convenient broiler broils meats deliciously with extreme ease.
9. Insulated oven keeps kitchen cool in summer. Opening oven door gives additional heat in kitchen during the cold months when desired.

### Modern Gas Ranges Are Safe

Gas ranges of today are approved by the American Gas Association, Good Housekeeping Institute and other organizations for safety as well as efficiency and construction.

### Modern Gas Ranges Are More Economical

Improved and more efficient top burners, insulated oven, and oven heat control eliminate unnecessary waste of gas.

## MODERN GAS RANGE vs. ELECTRIC RANGE

### Modern Gas Ranges Are More Attractive

Greater variety of design and color insure the gas range matching correctly any customer's color scheme or kitchen arrangement.

### Modern Gas Ranges Are More Convenient

1. Super Speedy gas top and broiler burners are twice as fast—there's no waiting for elements to heat up—saves time.
2. Gas "Cooking Top Burners" have a multitude of speeds ranging from Super Speed to the Slowest Simmering Flame. Electricity has only three speeds: which require more pot watching and greater time.
3. Ventilated Gas Oven eliminates necessity of baking foods in a foul smelling oven — with Gas there is no mixing of flavors.

### Gas Cooking Is Comfortable

Insulated Gas Ovens, too, result in a cool kitchen in the summer. However, in the winter, lighting the oven and opening the door, gives added heat economically when desired.

### Gas Cooking Is More Dependable

Gas Service is always available even during the coldest weather and severest storms. Gas requires no complicated system of over-heated street wiring, which is so frequently damaged by storms resulting in interrupted electric service.

### Gas Ranges Have Lower Maintenance Cost

The Maintenance on a gas range averages less than $1.00 during the life of the range or a nickel a year.

Maintenance cost on electric ranges for expensive switches and elements average $12.00 per year. A prominent range manufacturer verifies this maintenance cost by stating that such cost averages annually 7½% of the retail price of the range.

**Gas Ranges Have Lower First Cost**

A Gas Range of equal quality costs about 50% less than an electric range.

**Gas Ranges Have Less Depreciation**

The life of the gas range is much longer. Gas ranges are used upwards to forty years—average life twenty years. Electric ranges, due to complicated electrical mechanism, also due to moist oven, wear out and rust out in a short time. Average life of electric range is only ten years.

**Gas Cooking Is More Economical**

The operating cost of Gas is lower. It is the cheapest of the convenient fuels:

| *Gas Cost Per Therm* | *"Equals"* | *Electric Cost per Kilowatt* |
|---|---|---|
| $.06 | | .0040 |
| .07 | | .0047 |
| .08 | | .0054 |
| .09 | | .0060 |
| .10 | | .0067 |
| .11 | | .0074 |
| .12 | | .0080 |
| .13 | | .0087 |
| .14 | | .0094 |
| .15 | | .0100 |
| .16 | | .0107 |
| .17 | | .0114 |
| .18 | | .0120 |
| .19 | | .0127 |
| .20 | | .0134 |

**Gas Cooking Pays Dividends**

| *Cost Gas Range* | *Cost Electric Range* |
|---|---|
| $80.00 | $160.00 |
| *Annual Depreciation* | *Annual Depreciation* |
| $4.00 per year | $16.00 per year |

**Gas Cooking Is Safe**

There is no danger in using gas —it is extremely safe. There is no electric equipment to wear out endangering Mrs. Housewife or children to shock.

Modern Gas Ranges are approved for safety as well as construction and efficiency.

**Gas Ranges Are More Modern**

Speed and Streamlining are modern. Gas has greater speed and gas ranges have more attractive designs and lines. That's why 13 out of every 14 convenient ranges sold today are Gas Ranges.

**Gas Cooking Is More Popular**

Over Fifteen Million American Women prefer "Gas Cooking" due to its super speed, greater flexibility, economy, modernness, dependability and greater convenience. Only 1,200,000 electric ranges are in use on this continent today, the major part of which are installed where "Gas Service" is not available. Over three hundred electric ranges were removed by us in one community in one year's time when Gas Service was made available.

**Prize Winning Letter Submitted by Miss Winifred Embleton, Niagara Falls Office**

Hello Jean:

I see your engagement is announced. Just called to extend Good Wishes.

Am still working at the Gas Office, it's ten years now, would you believe it? With that experience I should be able to tip off a friend on what the smartest women are using in the line of a range.

Of course, you will use gas, the modern fuel. It is far the fastest, most economical, easier to regulate and clean. Can't be beaten in any way. Have you noticed any of our stove advertisements? We certainly have some beauties in stock and suggest that you don't fail to see our display before deciding.

They are strictly modern, with automatic heat controls, pilot lights, fully insulated, stoopless and Astogril broilers and come in so many colors, you wouldn't have any trouble matching your kitchen.

You were always so fussy, Jean, I can't imagine you using an electric range. ARE THEY SLOW and completely out of the style class with Modern Gas Ranges! Fancy you getting dinner for Bob, after an afternoon bridge unless you use Gas. Our new ranges even have automatic clocks. What I mean by that is you can put a dinner, including meat, vegetables, and even dessert, in the oven and it will automatically shut off when you want it to—then all you have to do is open the oven door and dinner is ready. Gas range ovens are ventilated and that's why you can mix dishes, but in electric ovens it's impossible.

Call in the office and look around; you'll love the ranges and it's understood that nothing can compare with gas for heat and speed. A special sale is on, lower prices and easy terms—it would be to your advantage to call this week.

I'll be looking for you.

Winnie

## GAS COOKING vs. COAL, OIL or WOOD COOKING

**Gas Ranges Are More Attractive**

Gas Ranges are neater in appearance and hence beautify the kitchen.

**Gas Ranges Are Faster**

The maximum of heat is rendered instantly upon the turn of the gas range valve. There is no waiting to speed up the fire and heat up the stove.

**Gas Cooking Is More Convenient**

With Gas Cooking you merely turn the burner lever and the burner is lighted—no fires to build or running up and down stairs—no handling of dirty fuel, such as wood, coal or oil. There's not even the bother of ordering fuel.

**Prize Winning Sales Talk Won by Ed. Hales of South Dominion District, St. Catherines, Ont.**

Meter Reader:

"Good Morning Mrs. Smith—May I read your gas meter, please?"

Mrs. Smith:

"Come in—mind that pail on the cellar steps." (reads meter and comes up stairs)

Mrs. Smith:

"Do you know anything about electric stoves—this front burner won't get hot?"

M. Reader:

"Not much, except that they cost a lot for repairs."

Mrs. Smith:

"They do, don't they."

M. Reader:

"Yes, I understand the repairs on an electric stove cost an average of $12.00 per year during the life of the range. Did you ever think of changing to a modern gas range with all the latest improvements?"

Mrs. Smith:

"My husband talks about getting a gas stove every time we have to get the electric stove fixed."

M. Reader:

"With a gas stove you could forget about repairs—we are having a sale of gas ranges just now which should interest you, Mrs. Smith. The new "Clare" range we are featuring is made by one of the best known stove manufacturers in Canada. It is an all enameled range in white with gray trim. A damp cloth will keep it like new. The automatic oven control on it keeps the oven at any set temperature you wish. The four top burners, and that is where 80% of your cooking is done, are fast, efficient and economical. They are lighted by a new type of lighter—you just turn on the valve and the burner lights itself. You've used gas for water heating for a long time and you know how cheap it is, but you would be surprised at the speed and flexibility of it for cooking on one of these marvelous new gas stoves. The price is well within the range of everyone and you can buy one at practically your own terms. Wouldn't you like one of these modern ranges for your Christmas baking Mrs. Smith?"

Mrs. Smith:

"I would like to have one, but you had better talk to my husband about it. You could call tonight at 7'oclock and see him, if you like."

M. Reader:

Seven o'clock? I'll call and sell him a new modern gas stove for you, Mrs. Smith. Goodbye and thank you."

### Gas Cooking Is Cleaner

Gas Cooking insures clean cooking utensils. There is no soot as with coal, oil or wood. There are no ashes to remove or trimming of wicks, etc., with Gas. Clean gas cooking results in less redecoration expense.

### Gas Cooking Gives More Freedom

Regulated temperatures in the oven insure perfect baking results without watching. Just set the indicator on the regulator to the correct degree of heat and the regulator will do the watching. With a regulator equipped Gas Range, an entire meal can be cooked while Mrs. Customer is away for the afternoon. Gas also, through a multitude of speeds on top burners, gives the exact heat required and lessens worry of stove boil-overs.

### Gas Cooking Is Safe

There are no hazards with Gas—no danger of fire. Modern Gas Ranges are approved for construction, safety and efficiency.

### Gas Cooking Is Cool

Insulated ovens and no exposed and large heated cooking top surface makes Gas Cooking cool even in the extreme warm days. The correct amount of heat during cold days can be secured by lighting the oven and leaving the oven door open.

### Gas Cooking Is Cheap

The average cost of Gas Cooking for a family of four people is only two or five mills (one-fifth to one-half cent) per person daily. Gas for cooking is the greatest "Service bargain" for the home.

### Gas Cooking Is Modern

Fifteen Million Women prefer and are using Gas because it's smart and ultra modern to have convenience, speed, comfort, more leisure hours, more attractive kitchens, etc. Thousands of additional women this year and for years to come will oust drudgery, inconvenience and dirt from their homes by eliminating messy and uncontrollable fuels to enjoy Gas, the modern and most popular fuel.

# New Direct Fired Gas Heating Installation

By CHAS. D. GREASON

The Gas Service Company,
Kansas City, Mo.

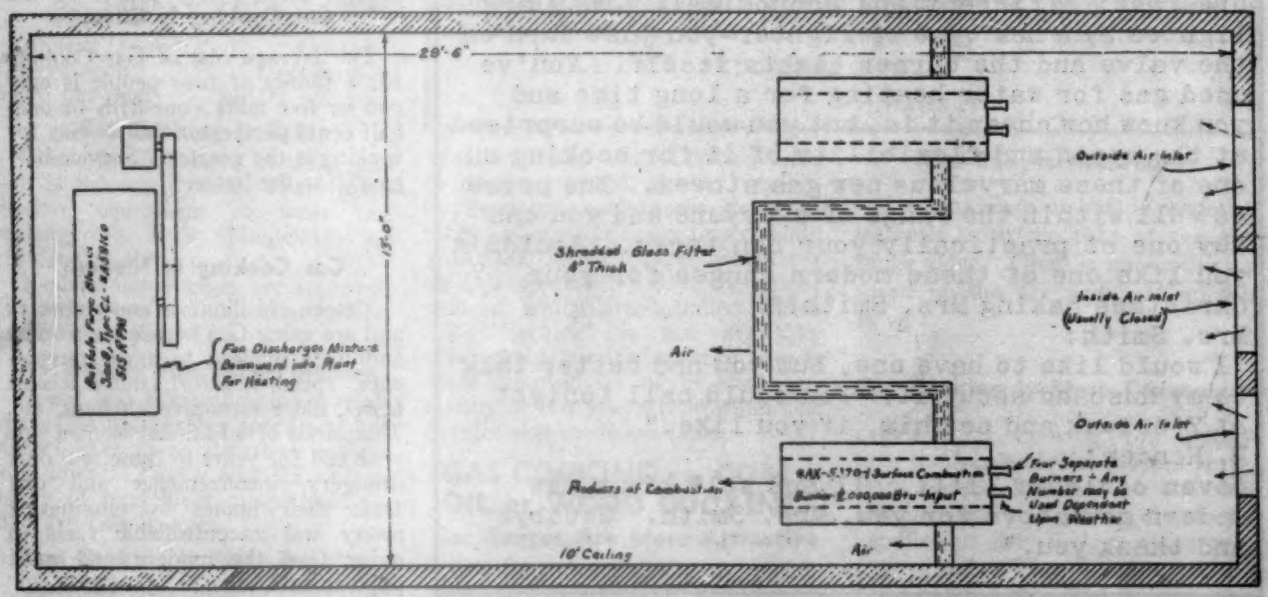
THE Fisher Body plant, located in Kansas City in connection with the large General Motors assembly plant, recently installed a new gas heating system for the body assembly plant. Frank Pexton, industrial engineer of the Kansas City Gas Company new business department; A. W. Lordahl, representative of the Surface Combustion Corporation, and H. W. Schramm, engineer from the Toledo plant of the Surface company, assisted engineers of the Fisher Body company in installing the control equipment.

Formerly, the Fisher Body plant in Kansas City had used large indirect gas heaters. Direct fired heaters are now used in the new system; the gas is burned, the products of combustion mixed directly with air, and the mixture blown directly into the plant. Most of the air to be heated is drawn from the outside; very little of the inside air being recirculated. This method of heating is very adaptable in body assembly plants due to the fact that a large amount of inside air is discharged to the atmosphere at spray booths. This method would not be adaptable if a large percentage of the inside air were heated and recirculated because of the increasing percentage of carbon dioxide that would accumulate.

The air is drawn by a large fan through 4 inches of shredded glass filter. In addition the fan pulls the products of combustion from the burner and the mixture is forced directly into the plant.

The control system is interesting. First, the fan motor operates continuously, and the burners cannot turn on unless the fan is in operation. Second, the pilots and the spark plug ignition are turned on manually. Third the flame from the pilot plays on the electrode of a Protectoglow tube. When a flame plays on the electrode, a current passes through the electrode. Fourth, the current through the electrode in turn energizes a relay. Fifth, if the plant thermostat calls for heat, gas to the main burners is turned on by the energized relay. The plant thermostat is free to turn on the main burners if the fan is in operation and the pilots burning. Also the system is protected against failure of air pressure or gas pressure. Air is used to keep the electrode free from dust, cool the Protectoglow tube, and actually operate the main gas valve. Each main burner has four smaller burners. The operator can turn on as many burners as desired. The outside temperature determines largely the number of burners to be used, the colder the weather the greater the heat input of the system.

This system operates at 100 per cent efficiency. The operators state that the system is very satisfactory. The main equipment consists of two No. AX5370-1 Surface Combustion Air Heaters, each rated at 2,000 cubic feet of natural gas per hour; 2 #R1001-2 Minneapolis Honeywell Protectrolays, two No. C500-2 Protectoglows; one No. A59100, size 9 Buffalo Forge Blower operated by a 20 H.P. motor. It is interesting to note that the 20 H.P. motor with a leather belt sets only 9½ feet in front of the main burner emitting 2,000,000 B.T.U. per hour. There are approximately 140 square feet of filter surface.



## Some Aspects of Corrosion Problems in a City Plant

(*Continued from page 39*)

sued to the construction crews showing where coating is to be used, where it is to be omitted, where insulating couplings are to be inserted, where shielding is to be provided, how this shielding is to be constructed and whether or not it is to be bonded to the main, where the original backfill is to be replaced with inert sand, where permanent electrolysis testing stations are to be provided for future observations and many other details having to do with the complete engineering of the protection to be given the line.

The liberal use of insulating couplings can completely eliminate the flow of current in a longitudinal direction. While every effort is made to avoid construction of the line in a location where it may be subjected to transverse action, that is to currents traveling from the car rail across the line to a water main or drainage cable, it is not always possible to escape these conditions. Through such areas the line is laid bare and the trench is backfilled with sand, of which we have plenty in Cleveland, or with other soil known to be noncorrosive.

Our services are generally coated though in some instances we find it necessary to leave them bare because of unavoidable cross currents. Insulating sleeves are not generally applied but are used where there are indications of current flow. There is a wide disparity of opinion about the use of coatings on services. This is very clearly shown in the replies to a questionnaire on house services circulated a couple of years ago by the A. G. A. Sub-Committee on Pipe Coatings and Corrosion. It is too long a story to review here and we mention it only because it is indicative of the attitude of distribution men in general towards the use of coatings.

The questionnaire was sent out as a result of a question asked at one of the Distribution Conferences by a man with many years of practical experience as superintendent of distribution for a large gas company. He asked this question: "Should surfaces be coated and if they are what effect will electrolysis have upon them?" Unfortunately this is a question for which no singular answer will suffice under all conditions, any more than one answer will suffice to the question as to whether this or that line should be reconditioned or replaced with a new one. Local conditions and local problems dictate different answers.

We have always been of the opinion that particular attention should be paid to services in order to prevent, in so far as it is humanly possible, the occurrence of leaks in close proximity to the walls of buildings; the reasons for this are obvious. In addition to the extra safeguard provided by the use of coatings, we block out certain areas of the city and inspect every service in that area at regular intervals. Services to all public buildings are given special attention. Inspection crews carrying combustible gas indicators test all street openings on regular schedule. By coordinating the efforts and records of all the departments involved, a comprehensive picture of the condition of the system can be obtained.

In conclusion we should like to emphasize the importance of following a logical procedure in abating the ravages of corrosion and of intelligently engineering all phases of a protection program whatever that program may be.

**Bring your gas plant problems to Semet-Solvay for solutions that will be most economical, incorporate the soundest engineering principles and fit operating conditions in every respect. No obligation is involved in discussing your needs with our engineers.**

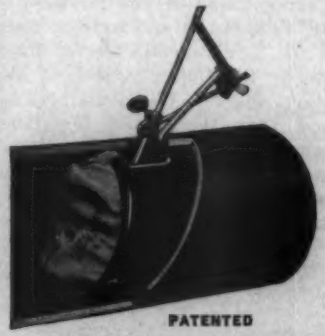
**SEMET - SOLVAY ENGINEERING CORP.**

40 Rector Street

New York, N. Y.

**STOPPERS SINCE 1897**

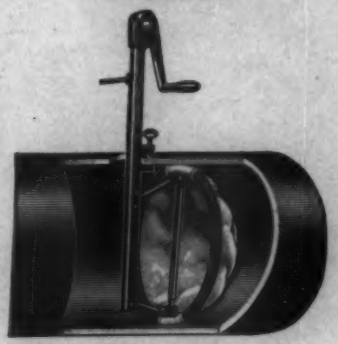
**THE GOODMAN STOPPER**



PATENTED

**WHEN LOCKED IN PLACE IT HOLDS**

**THE GOODMAN-PEDEN STOPPER**

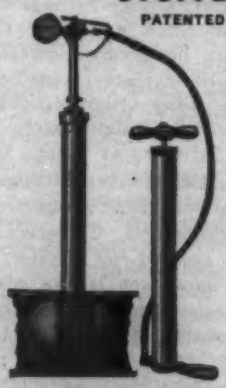


PATENTED

**Easily Manipulated**

**GARDNER-GOODMAN STOPPER**

PATENTED



A stopper for low and intermediate pressures.

For use on cast iron or steel, oversize or undersize mains.

Easily inserted in top, bottom or side of main, in open excavation or under pavements.

For pressure work, use two or more stoppers in parallel.

Sizes, 2 inch to 20 inch.

**SAFETY GAS MAIN STOPPER CO.**

523 ATLANTIC AVE.

BROOKLYN, N. Y.

# EQUIPMENT NEWS

## Foxboro Has Exclusive Agency for "Commercial" Orifice Fitting

Announcement has been received of the appointment of The Foxboro Company, Foxboro, Mass., as sole distributors of "Commercial" Orifice Fittings, made by the Commercial Iron Works of Los Angeles, California. It is believed that the broad facilities for trained engineering service offered by The Foxboro Company will aid users to apply the Fittings more successfully,

in addition to the obvious advantages of securing undivided responsibility for an entire metering set-up.

In "Commercial" Orifice Fittings bypasses are eliminated entirely. The threaded elevator lift permits lowering or lifting of orifice plates regardless of line pressure, without shutting down the line and with complete safety to the operator.

The "Commercial" Orifice Fitting is so designed that set screws in the pressure areas are eliminated. Centering of the orifice is assured by means of guides. Also important is the plate clamping mechanism which makes plate distortion impossible. One turn of the operating shaft securely clamps the plate and insures a tight joint.

A feature that will interest the operator is the ease with which the orifice plate can be changed. This job can be accomplished safely by one man in a minimum amount of time and space.

# NEWS OF THE INDUSTRY

## C. O. Nordensson Joins Roberts-Gordon Industrial Department

C. O. Nordensson, widely-known authority on industrial gas applications, and for many years general manager of the Lee B. Mettler Co., has joined the Roberts-Gordon Appliance Corporation of Buffalo, N. Y. where he will head the company's industrial gas burner activities.

Mr. Nordensson has had wide experience in the application of gas to industrial uses.

He is the inventor of the Duquesne Burner, which was the first multi-unit low-pressure burner manufactured and sold by the Duquesne Burner Service Company of which he was General Manager.

"The addition of Mr. Nordensson to our staff has greatly accelerated our plans for entering the industrial burner field on an aggressive basis," said W. S. Gordon, Jr., President of Roberts-Gordon. "Besides bringing us an old-world background of thorough technical training, he brings a practical experience of the widest scope. His applications of gas to the problems of steel works, copper refineries, chemical industries, glass works, brick kilns and bakeries make his counsel especially valuable in those fields."

Mr. Nordensson has already taken up his duties at the Roberts-Gordon Plant in Buffalo.

## Robert W. Hunt Company Announce Changes in Personnel

Robert W. Hunt Company, Engineers, announce a change in the personnel of their western offices as a result of the advancement of Mr. F. M. Randlett, Pacific Coast Manager, to Vice President and General Manager of the company at Chicago.

Mr. M. H. Merrill will become Western Manager at San Francisco. Mr. Merrill has been identified in an engineering capacity with various utility and transportation companies during his long professional career. Since 1919, he has been President of the M. H. Merrill & Company, Consulting Engineers, and during the last three years, has served as Consulting Engineer at San Francisco for Robert W. Hunt Company. Mr. Merrill is a member of the American Society of Mechanical Engineers, American Institute of Electrical Engineers

## Standard Gas Equipment Appoints Herbert C. Erhard General Sales Manager

Announcement is made by the Standard Gas Equipment Corporation of the appointment of Herbert C. Erhard as general sales manager of the company. He succeeds J. F. Donovan, who recently resigned to become affiliated with the Gas Merchandising Division of Williams & Saylor, Inc., New York merchandising and advertising counsellors.

Mr. Erhard, who has been assistant general sales manager of the Standard Gas Equipment Corporation during the past four years, has a long record of service with the company. He originally became connected with the former William M. Crane Co. in 1915.

## Dr. Hainsworth, Scientist, Elected a Vice-President of Servel, Incorporated

Dr. William R. Hainsworth, of Larchmont, N. Y., nationally known refrigeration science authority, has been made a vice-president of Servel, Inc., manufacturers of Electrolux refrigerators at Evansville, Indiana. Dr. Hainsworth, whose full title is vice-president in charge of engineering, was elected at a meeting of the board of directors held in New York on April 18.

Dr. Hainsworth received in 1933 the Charles A. Munroe Award granted annually for the most outstanding contribution to the American gas industry. This high honor was bestowed on Dr. Hainsworth in recognition of his developments of the air-cooling principle in gas refrigeration.

## The Selas Company Engages W. M. Smith of New York

The Selas Company, Philadelphia, has engaged W. M. Smith, 50 Church Street, New York, to manage engineering and sales activities in the major industrial area centering in New York. W. M. Smith brings to the engineer-

## Two Fabricated Gas Holders Shipped to China

Stacey Brothers Gas Construction Co., Cincinnati, O., recently started on its way an eleven car shipment of fabricated steel, representing one 350,000 cu. ft. and 175,000 cu. ft. gas holders to be erected under their supervision for the Youngli Chemical Co. in China. They will be used in connection with the first plant to be built in China for the production of fertilizer from atmospheric nitrogen.

ing problems involved in the application of gas fuels, many years experience in the fields of process-heating and combustion, having been sales manager of the Furnace Department of the Carborundum Company, eastern representative for The Electric Furnace Company, eastern manager of Tate-Jones & Co., Inc.

### C. C. Morrison, National Representative of Pittsburgh Equitable Meter Company

C. C. Morrison has been appointed National Representative of the Pittsburgh Equitable Meter Company and its subsidiary, Merco Nordstrom Valve Company.

Through his former connection as President of the Pennsylvania Pump Company of Pittsburgh, and experience of many years during which he was associated with other manufacturers of measuring equipment, Mr. Morrison, a University of Michigan graduate, is looked upon as an authority on equipment and measuring problems.

# Personals

### Ralph D. Davis Now with Consolidated Gas Company

Ralph D. Davis, who has been associated with the automotive field for a number of years, has taken a position in the engineering department of the Consolidated Gas Company in New York city, one of the largest utility companies in the world.

Mr. Davis, who was connected with the McConnell Motor Sales at 12 Broadway, commenced his duties with the utility concern last week, and will move his family to New York about June 1.

#### Ten Years in Auto Field

For about ten years prior to his entrance into the automobile business, Mr. Davis was affiliated with the Fulton County Gas & Electric Co., now the New York Power & Light Corp., serving as resident manager for a time.

Mr. Davis will be connected directly with the gas department of the Consolidated Gas. His duties will pertain to inventory and appraisal of the properties of the company. He will be one of a group of ten expert engineers who are to enter training immediately to prepare for the work. Later, he will serve as instructor in this department.

### J. R. Fussell Is New Manager of Calhoun Company

Mr. J. R. Fussell, formerly manager of the Calhoun Gas Company, has succeeded Mr. J. H. McCook as manager of the Cedartown office. Mr. McCook has been transferred to Barnesville, where he will be in charge of the gas company there.

### Frederick Joseph West Awarded Walton Clark Medal

The Committee on Science and the Arts of The Franklin Institute of Pennsylvania has recommended the award of the Walton Clark medal to Frederick Joseph West, of Manchester, England, chairman and managing director of the West Gas Improvement Co., Ltd. and West Gas Improvement Co., New York. Mr. West has accepted the award and presentation will be made May 15 in Philadelphia by The Franklin Institute.

The United Gas Improvement Company of Philadelphia, on November 30, 1926, presented to The Franklin Institute a sufficient fund to permit of the award, not more frequently than once a year, of a gold medal to be known as the Walton Clark medal, "to the author of the most notable advance in knowledge, or improvement in apparatus, or in method, concerning the science or the art of Gas Manufacture, or distribution or utilization in the production of illumination or of heat, or of power." The obverse of the medal bears a profile relief of the late Dr. Walton Clark and is inscribed around the margin "The Walton Clark Medal." The reverse bears the legend "Awarded by The Franklin Institute to (name of recipient) for original and notable work in the gas industry."

The committee which has recommended Mr. West for the award consists of J. B. Klumpp, Chairman; O. B. Evans, M. M. Price, J. M. Rusby and J. M. Weiss. Associate members are C. J. Ramsburg, A. B. Macbeth and F. P. Tarratt of England.

In its recommendation and citation, the committee states, "We have selected Frederick Joseph West on account of his activities during his entire life in the development and promotion of the manufactured gas industry, for the advances he and his organization have made in the design and construction of apparatus used in the carbonization of coal, for his research work in determining the efficiencies and practicabilities in the use of various coals in the gas industry.

"We have also selected Mr. West on account of the far-reaching work he has done to encourage the education and training of engineers and the national work he has done to foster a better understanding between the employer and the employee connected with the gas manufacturing industry in Great Britain."

Mr. West was born in England in 1872. He is a son of John West, former president of the Institution of Gas Engineers of Great Britain, who for forty years was engaged in the development and construction of coal gas distillation plants. Mr. West joined the West Gas Improvement Company in 1894 and has been chairman and managing director of that company since 1922.

### Edward E. Bair of Stroudsburg Takes Furlough

Edward E. Bair, manager of the Citizens Gas Company, of Stroudsburg, Pa., has been granted a several months' furlough, at his own request, because of ill health and he has already left for a health resort where he will remain for several months in an effort to recuperate.

Mr. Bair went to Stroudsburg about three and a half years ago to become manager of the local office of the company.

Mr. Bair's position will be temporarily filled by H. S. Dutton, of Hagerstown, Md., who was division commercial manager of the Centralization office in Hagerstown, Md. Mr. Dutton goes to Stroudsburg with more than thirty years' experience in the artificial gas business.

### Changes in Staff of Georgia Natural Gas Corp.

E. C. Jarboe, formerly manager of the Newnan office of the Georgia Natural Gas Corporation, has resigned to take the position of sales manager for an affiliated company . . . the Georgia Public Utilities Corporation, of Augusta, Ga.

This has led to a number of changes in the staff of the various units of the Georgia Natural Gas Corporation. A. T. Faulkner, formerly manager of the company's office in Thomaston, has been transferred to Newnan as manager of that office. J. P. Weeks, formerly fitter-manager for Carrollton, has been named manager at Thomaston, Ga. and W. P. Woods, an engineer for the corporation, has been named manager of the Carrollton office.

Ralph Prader, formerly a salesman in the Rockmart office of the corporation, has been named manager of the Calhoun office. J. R. Fussell, formerly manager of the Calhoun office, has been transferred to Cedartown, as man-

ager of that office, and J. H. McCook, formerly manager of the Cedartown office, has been named manager of the Barnesville office of the company.

He takes the place left vacant by Ray Bush, who has been transferred to the Rockmart office of the corporation.

## Brooklyn Union Gas Co. Elects Officers

James H. Jourdan

**James H. Jourdan**, President of The Brooklyn Union Gas Co., Brooklyn, N. Y., since 1914, has been elected Chairman of the Board, and Clifford E. Paige, Vice-President since 1924, was elected President.

Mr. Jourdan will have completed 53 years of service with the company on June 6th. He started as a laborer in the street division in 1882. In 1895 various companies were merged with what is now The Brooklyn Union Gas Company. In 1910 he was made Vice-President and Director and in 1914 was elected President.

Clifford E. Paige

**Clifford E. Paige**, who succeeds Mr. Jourdan as President, entered the gas industry in 1903 with the Springfield Gas Light Co., Springfield, Mass. In 1912 he had become Manager of the Malden and Melrose Gas Company. In 1919 he was appointed Manager of the Worcester Gas Light Company and three years later was elected Vice-President of Charles H. Tenney & Co., Boston, Mass.

**W. H. Weber** was elected assistant secretary.

## Gas Engineering Graduates at Johns Hopkins University

In June there will be a graduation from the Gas Engineering Course at the Johns Hopkins University, Baltimore, Md. This course is the only one of its kind in the East and is in charge of Dr. Wilber J. Huff. The graduates are: Richard B. Barger, Arthur R. T. Denues, George M. Carter, Roger B. Cobb, Henry R. Cook, Edward D. Crouch, Henry H. Dinneen, John A. Eppler, George R. Faustman III, James J. Hayden, Jr., John Mitchell, Jr., William G. Schreitz and Talbott H. Walker.

## Manufacturer's Sales Help

**The manufacturers of appliances issue from time to time Folios containing valuable sales campaign material for all those who have to do with the sales of gas burning appliances. So that a comprehensive idea can be had of the contents of these Sales and Advertising Folios we will list the contents of these as they come to the Journal office.**

Surface Combustion Co., Toledo, Ohio, Ad — Folio — Advertising and Merchandising Material for Companies on Gas and Janitrol Home Heating Equipment. It contains the following material:

**Outline of Campaign**

16 pages of advertising suggestions—illustrated—space for local copy.
19 pages of various sized illustrations to be used in advertising copy.
1 page, showing Janitrol cut, and Janitrol in place in various types of furnaces.
4 Small folders for direct mail use, printed in colors.
1 Booklet "Fire Your Furnace from Your Easy Chair."
1 Booklet with envelope "Your Housekeeping."
1 Booklet "Living Better in Your Present Home."
1 Booklet "Modern Home."
1 Booklet "Home and Comfort."
1 Envelope containing furnace literature.

In planning and creating these advertising and merchandising helps, the objective in mind was to make helpful material available that could be adapted to any locality selling gas heat.

LOW OPERATING COST is what counts..
*Investigate* STACEY-KLONNE HOLDERS

Low operating and maintenance costs
are among the outstanding features of
STACEY-KLONNE DRY SEAL GAS HOLDERS.
Hot weather or cold, they function perfectly.
Operating savings alone justify their installation.

OFFICERS
L. J. Brown, Chairman
Wayne Stacey, President
Paul C. Rodgers, Executive V. P.
R. B. Luebbe, V. P. and Chief Engineer
W. S. Guitteau, Vice President
A. E. Harvey, Sales Engineer

STACEY BROTHERS
GAS CONSTRUCTION CO.
CINCINNATI, OHIO

STACEY-KLONNE GAS HOLDERS
TELESCOPIC HOLDERS
"STACEY BULLET" HIGH PRESSURE HOLDERS
PURIFIERS

# BARBER *Gas Pressure* REGULATORS

**Many of the larger Manufacturers of Gas Appliances, as well as Gas Companies, who use large quantities of low pressure Gas Pressure Regulators have switched to BARBER, after making comparative laboratory pressure drop tests and proving for themselves that no other make will show as low pressure drop.**

**They also prefer the NEW style BARBER Regulators because of their precise machining and assembly; bronze bodies, compactness and general good appearance — as well as their attractive prices.**

**Why not write today for "stock" samples, complete literature, prices and discounts on the BARBER line?**

**THE BARBER GAS BURNER CO.**
**3702 SUPERIOR AVE., CLEVELAND, O.**

Made in ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2" sizes

**Byllesby Engineering and Management Corporation**

**Wholly-owned subsidiary of**

**Standard Gas and Electric Company**

**231 South La Salle Street, Chicago**

**New York Pittsburgh San Francisco**

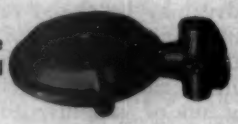
# CONNELLY

## *For Gas Regulation:*

Connelly Regulators are pioneers in the Gas Industry and are adaptable to every requirement of volume and pressure. Bulletin 200-B-1.

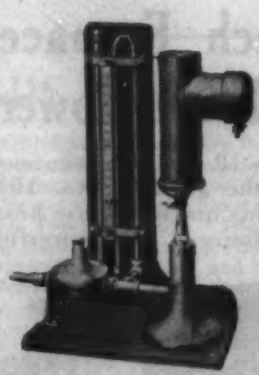
To meet the increasing demand for Appliance Regulators, Connelly has developed a full line of weight loaded and spring loaded Regulators.

Connelly Service Regulators reduce high inlet pressure to any desired outlet pressure.



Connelly District Regulators are fully enclosed, self contained and may be submerged without affecting the operation.

Connelly Back Pressure Valves prevent reverse flow in gas lines. They insure safety on industrial burners using boosted air pressure. Bulletin 301-B-1.



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BOSTON, MASS.—Gas Equipment Corp.

## Service Regulator Testing

*(Continued from page 36)*

A diaphragm shrunken, or assembled improperly may prevent the full opening of the valve; too small an orifice may be used, the valve material may be too thick, thus restricting the opening, or the adjusting spring used may have, due to use or improper selection, poor operating characteristics.

In this position the rate of flow valve may be closed rather quickly, simulating the action of a thermostat valve. The regulator should respond quickly enough to prevent the building up of pressure to too high a point. It should be remembered that this test is severer than the actual action in service since in service much more volume in the form of piping is present to absorb the pressure increase. If the regulator appears too sluggish in closing off, the vent hole should be enlarged slightly, permitting faster diaphragm action.

If the tests described above are properly performed, it can be certain that the regulator is in good condition on being set. Whether or not it will remain in good condition is a question of experience. Some gases are hard on valves, and will in time allow high lock up pressures, up to the point of dangerous house line pressure, or blowing seals. The valve material chosen may alleviate this trouble. Dirt and scale, particularly in new systems, can cause trouble with valves. Diaphragm deterioration is another source of trouble and will depend somewhat on the original leather and dressing used. It would seem logical to renew the dressing in a service regulator diaphragm every time it comes to the shop, no matter for what reason. It is probable that all diaphragms eventually seep a little gas, perhaps never getting to a dangerous volume until the diaphragm is completely dry. As stated above, these factors, depending on age and gas condition, can best be taken care of in any individual property by inspection and servicing based on experience. The performance of regulators on being set, however, is a matter of thorough testing, under known and standard conditions. This is a very definite and easily controlled matter, and should be standardized on each property.

### Convention Calendar

**May**

2-3-4 American Gas Association Distribution Conference, Hotel Cleveland, Cleveland, Ohio.

6-9 Natural Gas Department, American Gas Association, annual convention, Hotel Peabody, Memphis, Tenn.

7-9 Pennsylvania Gas Association, annual convention, Skytop Club, Skytop, Pa. F. W. Lesley, secretary, York, Pa.

13-15 American Gas Association Production Conference, Hotel New Yorker, New York, N. Y.

**June**

10-11 Canadian Gas Association, annual convention, Quebec, George W. Allen, secretary, 21 Astley Ave., Toronto, Canada.

20-22 Michigan Gas Association Annual Convention, Grand Rapids, Mich. A. G. Schroeder, Secy.

**October**

14-18 American Gas Association, 17th annual convention, Atlantic City, N. J. Alexander Forward, managing director.


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## Safety Pilots—Their Design and Performance

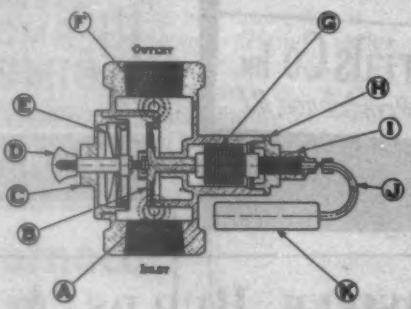
*(Continued from page 42)*

hours of continuance in the open position should serve to reveal any obvious defects and when combined with detailed constructional requirements and material specifications which will be discussed below, should insure satisfactory performance.

The American Gas Association tests all automatic devices designed to prevent the escape of unburned gas for satisfactory operation after they have been maintained for 720 hours in the position which, in service, permits normal passage of gas. Two samples are tested and after they have been maintained in the open position for a specified period of time, they are re-examined for leakage and operating time. Incidentally, it is required that the time of operation check those values obtained as a result of the initial examination of the device.

In addition to tests on devices after maintenance in an open position, it is highly desirable to ascertain the effect of opening and closing the device in a normal manner. The number of consecutive cycles of opening and closing to which a safety device should be subjected in order to reveal any defects is determined by the type of service that it is designed to meet. For those devices operating each time the main burner is shut off or turned on, the American Gas Association prescribes 100,000 cycles of operation, a cycle consisting of one opening and one closing of the valve. For devices operating only when called upon in an emergency 100 cycles is felt to be sufficient. Rate of cycling must of necessity be such as to avoid undue delay in testing and usually is the maximum rate consistent with the time of operation of the device. Where possible the continued operation tests may be conducted on one of the samples used in the examination of the device for operation after 720 hours maintenance in the open position and the two tests may be conducted simultaneously in order to save expense and avoid delays. To quote from the Laboratory Standards, the device shall withstand the required number of cycles of continued operation "without any mechanical failure, impairment of operation, and/or apparent damage, and without the development of leakage." After the device has undergone this test it is subjected to leakage and time of operation tests previously discussed.

It should be noted that in conducting the tests previously described, the sequence is of some consequence. As many tests as possible are conducted on the device "as received." Such tests include those for leakage, capacity, and pilot operating characteristics, which require no change in the manufacturer's setting with possible exception of the latter test where adjustable pilots are provided. Following these tests an examination is made of the time of operation. Adjustments, if necessary, are made in strict accordance with the manufacturer's instructions. The device is then tested for operation after being maintained in the open position and subsequently for continued operation. After each of the two last mentioned tests, the device is, under the requirements, subjected to the leakage and time of operation tests in order to ascertain the effect of these service tests on its functioning. Such a sequence of tests permits allocation of failures




Courtesy of Spencer Thermostat Co.—Gas Operated Bomb Type Safety Pilot with Snap Disc Mechanism. A—Pilot inlet connection boss. B—Valve. C—Mechanism Housing Cap. D—Manual pull out button. E—Spencer snap acting corrugated disc. F—Pilot outlet connection boss. G—Bellows. H—Bellows housing cap. I—Lock-nut. J—Revolving capillary. K—Heat bulb.

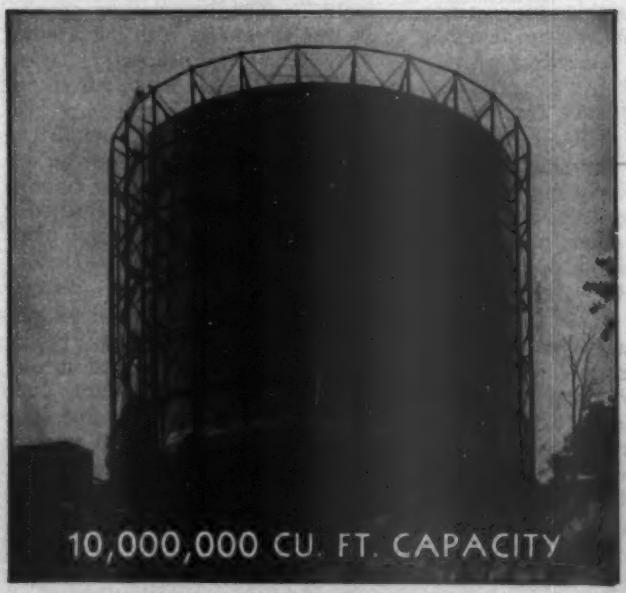
to the proper source and assists in an analysis of causes of faulty operation.

Information obtained from the tests previously discussed is supplemented by a detailed examination of the construction and assembly of the device. Its construction should be such that there will be no indication that it will become bent, warped, or defective in service, and all its features of design should meet reasonable concepts of safety, substantiality and durability. Valves and mechanisms should be constructed of corrosion resisting materials. Bodies of devices should be sufficiently rugged to withstand all conditions of normal handling such, for example, as connecting it to gas piping. To avoid errors in installation, devices should be suitably marked to indicate inlet and outlet connections and for convenience all such connections should be provided with American Standard Taper Pipe Threads. Where semi-rigid tubing is used, S.A.E. Standard fittings are recommended. Adjustment means, if provided, should be adequately protected against accidental dislodgment and it is desirable to have heads of by-pass screws and other adjustments capped or otherwise protected to avoid tampering by inexperienced persons.

Pilot orifices as well as all moving parts of the device should be readily accessible for cleaning. This is very important in the case of orifices because of their susceptibility to clogging. Various attempts have been made to eliminate this fault, such as by traps or screens. Such contrivances may partially limit difficulties from this source but usually their function is to delay the final fouling of the orifice. Furthermore, both traps and screens, if used, need to be made accessible since they also will require periodic cleaning.

As an added safety feature recommendations have been included in the Listing Standards that the construction of automatic devices designed to prevent escape of unburned gas be such that they will shut off the main gas supply in the event that the actuating element breaks or ruptures; or a connecting link between the element and valve becomes warped, bent, or otherwise distorted in a manner which might prevent proper performance. Such a design offers additional assurance that unignited gas will not under any circumstances be permitted to escape.

The American Gas Association, through its accessory testing and certification program, has provided means whereby the acceptability of automatic devices designed to prevent escape of unburned gas can be reliably determined in advance. The listing requirements for such devices are based on the combined experience of the gas industry and the Association's requirements committees in addition to scientific and practical data made available through an extended program of investigation of all available types and makes of such types of equipment. They include constructional requirements covering such matters as adjustments, strength, resistance to corrosion, and assembly; and performance tests to insure proper operation, including requirements covering time of operation, leakage, capacity, pilot operating characteristics, performance after an extended period in the open position, as well as continued operation, or life tests, simulating an extended period of usage in service.

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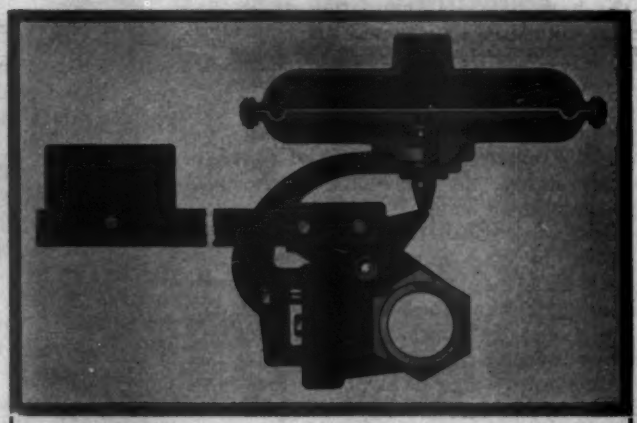

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GAS CONTROL SINCE 1892

## Factors and Trends in Meter Maintenance

*(Continued from page 82)*

in the present problem have a more vital importance. The progressive strides of the gas industry have made each element more acute, more sharply defined, than heretofore.

The second exception results from the valuable analytical work which has already been done in this field. We have today, a foundation of actual company experience on which to build. Proven record systems are available. Performance data, requiring many years to assemble, are at hand as useful signposts, furnishing the impetus and example of past achievement. We have the further advantage of being able to combine statistical results from several companies to give composite performance data. This minimizes or even eliminates local factors and, within the scope of the analysis, indicates the presence of general performance trends and the nature of these trends. Much of this past experience and recorded data has been analyzed with this in view. It is impossible to go into the details of these studies within the scope of this discussion. It is interesting, however to note certain points which appear to be clearly developed.

1. There is further confirmation of the divergent group performance figures which compose the general average figure.


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2. There is ample supporting evidence of earlier conclusions that meter age, regardless of intervening repair, is a primary factor in performance results.

3. Deviations from correct proof, both fast and slow, appear according to a fairly regular pattern through the life of the meter. These deviations occur both in the spreads of the proof zones and in the number of meters in each zone.

4. Based on this pattern, the average error shows a definite trend and we find instances where the average error for a particular group is over three times as great as that for the whole group, and from five to eight times as great as those of other groups taken in the total.

5. Class of repair and intervening service are definitely reflected in performance results. The importance of this information is that it provides the key to the correct application of a specific class of repair, based on past history of repair and future expected service. Successful meter repair should include the principle that when a meter leaves the shop it will render satisfactory service until its next periodic inspection. The correct application of this principle to routine repairs depends on an exact knowledge of past experience with similar groups of meters. Of course, this excludes the incidental returns for change of address, not-in-use, alterations to premises, etc., which are beyond the control of any company and which constitute only a minor percentage of total incoming meters. The purpose of this data, once available, is three-fold.

(a) It provides specific information for the correct segregation of repairs into separate classes.

(b) It offers a reliable method of reducing the number of meter removals, for cause, to a minimum.

(c) It provides tangible evidence for the selection and operation of a correct test period.

6. The sixth major point gathered from recorded data is, that the unit repair cost is directly related to the correct performance. In his discussion of "Periodic Inspection of Consumers' Meters," Mr. Vittinghoff advanced this thought when he stated—"The repairing of old meters is naturally more expensive than that necessary on meters of more recent make." The association of correct performance with the amount of overhauling necessary, seems quite logical and has been recognized in many quarters. It remained for records of actual experience to bear out this prime association and, thereby, to remove the subject of meter performance than the academic field and place it in the field of practical economy.

7. This inverse relationship of correct performance and repair cost is further confirmed in the analyses of groups of meters over an extended period of time. In this case the maintenance cost is resolved into cost per meter year of service, and we find that as the correct performance declines the maintenance cost per year increases.

### The Value of the Evidence

In brief, the evidence at hand points to a steadily increasing emphasis on sound practices of meter maintenance.

This trend emerged during a period of adverse economic conditions and was fostered by the will of the gas industry to adapt itself to changing circumstances and to extend to its customers a thoroughly modern, efficient, and reliable service. New thought demanded new data, and new data opened new channels of improvement. We are greatly indebted for the tremendous improvement which has been achieved, primarily, in the methods of handling, testing and repairing equipment.

In this trend there is greater attention to vital factors which have not, heretofore, been fully recognized as having a practical bearing on meter repairs. These new factors introduce broad possibilities for more successful gas service and can be applied to supplement the activities of the repair department. They offer constructive aids to this department and greatly enhance the value of its highly important function.

The value of performance analysis, though clearly apparent today, will greatly increase as further data is assembled. Not only the industry materially profited by the use of analyzed records, it can also look to these as a thoroughly proved avenue of approach, in formulating better policies of meter maintenance. These policies merit our closest attention for we face them with the force of past experience, the demands of present conditions and the urge toward future progress.

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## Economics of the Gas Industry

*(Continued from page 26)*

to 85% loss incurred in the generation of mechanical or power form of energy.

Therefore, where light and power are involved the electrical industry has a just and due field but where heat is desired the fundamental slogan of our industry holds true.

TABLE III

100% represents the energy in the original fuel

| | For Heat | | For Mechanical Energy or Power | | |
|---|---|---|---|---|---|
| | Gas | Electricity | | Gas | Electricity |
| Energy in fuel..... | 100% | 100% | Energy in fuel..... | 100% | 100% |
| Conversion loss into energy for transportation ..... | 20% | 75% | Conversion loss into energy for transportation ..... | 20% | 75% |
| Energy left for distribution ..... | 80% | 25% | Energy left for distribution ..... | 80% | 25% |
| Transmission & conversion loss into useful heat ..... | 24% | 5% | Transmission & conversion loss into power ..... | 60% | 5% |
| Available for use.... | 56% | 20% | Available for use.... | 20% | 20% |

"Where heat is desired it can be better done with gas."

It is for these reasons, therefore, that both gas and electricity have developed to supply the various energy requirements of a community, since each has a definite field in which it has great advantages. This is also why, for the good of society as a whole, these two forms of energy transmission should continue to function in the future. It is when we try to force the use of one form of energy into a market for which it is not the most economic that troubles arise, which sooner or later will adversely affect and delay our return to a sound economic condition. As will be later discussed, we see all too many examples of this tendency in our present political objectives. This situation just outlined in Table III also is the reason which eventually will make the so called "combination company" a sound instrument in our economic picture, since under such operation there is involved less duplication of expenses and also there is a reduced tendency to force either type of energy into markets for which it is not intended and for which it is not economic.

While we are discussing this subject, let us digress for a moment and see how these fundamentals have worked out practically.

It will surprise you that the average uses of energy in a community or in a home in the form of heat are from 3 to 10 times that necessary for light and power.

Let us consider a typical home with an average consumption of 50 kw-hr. a month. This home is using 50x3412 B.t.u. or 170,000 units of energy. This same average home uses 3000 cu. ft. of gas which at 540 B.t.u. means 1,630,000 energy units in the form of gas or nearly 10 times as much as is used in the form of electricity.

When the present typical energy used in a community in the form of gas and electricity includes domestic, industrial and commercial customers the ratio is in the neighborhood of 3 to 1. These are figures seldom realized. When we consider the total available logical market, the factor becomes even larger. These features cannot help but impress one with the future of our industry.

Another example that these fundamental principles are not mere theory but actually work out in practice is the rate of development of these two forms of energy.

Let us examine the record of the past 15 years of a company such as the one I happen to represent, which is more or less typical, during which time electric utilization has had a tremendous public acceptance and its most rapid development. It must be remembered that the gas industry was already established when the electric industry started.

TABLE IV

| | |
|---|---|
| Increase in number of electric customers in 15 year period ..... | 415% |
| Increase in number of gas customers in 15 year period ..... | 138% |
| Increase in energy sales in electricity in 15 year period ..... | 204% |
| Increase in energy sales in gas in 15 year period ..... | 177% |

In other words, the energy growth in the case of gas was nearly as rapid as the electric and yet the electric to accomplish this had to expand its number of customers over four times as compared with only a slight increase in gas customers. These are interesting figures to ponder over.

Let us see if there are any other fundamentals which may be working in our favor and again we find fortunate conditions. Electricity cannot be stored, while gas can be stored. This means that generating capacity in the case of electricity must be as large as the indicated momentary peak, while gas holders enable generating capacity under average conditions to be installed one-half the peak load. This means a tremendous saving in capital necessary to supply a given load or an investment per unit of energy in the case of electricity which is over four times that necessary for gas.

Furthermore, where transmission costs are concerned, recent studies show that gas can transmit a million horsepower hours of energy a distance of 283 miles for a cost of $65.00 for direct operation and fixed charges, which energy hours in the form of electricity will cost $190.00.

Distribution costs in the case of gas and electricity to cover customer costs and fixed distribution charges run perhaps only slightly higher in the case of electricity as compared with gas. However, in the case of gas we are talking about a complete underground system with all the inherent reliability that goes therewith.

These are all points to bear in mind in the picture which we are trying to develop as to what direction we should be pointing to improve our social economic system. All these points also cannot help but arouse our confidence in the eventual future of our industry, for sooner or later the economic laws will iron out any attempt to run counter to them.

Perhaps we are now ready to draw a few conclusions. I believe we could all be loyal as could be to an administration that is really trying to pull us out of the depression by sound economics. But what do we find?

At these times, when unemployment is our biggest problem, we find vast water power programs being developed which are the poorest employers of labor that we know of (except temporarily in the installation thereof) and which generally cost more than an equivalent amount of power can be developed by coal. Furthermore, it is being proposed to almost force this energy to be used where heat is desired in cooking, water heating and the like, which might better be done by gas. Could anything be more uneconomic?

This plan is apparently aped after the so called progress along these lines in countries like Canada and Sweden without careful analysis of the fact that there may be sound economic reasons for it in those coun-

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tries. Canada and Sweden have relatively no coal. They have no alternative. Such developments in their country are sound. Every bit of energy so developed means that much less coal to be imported from foreign countries which importation is a drain on their national wealth and they should, therefore, make every effort to develop hydro-power.

In their minds it may even possibly justify, as a national policy, their subsidizing of hydro programs and selling the energy below cost to the householder as they do to force and develop a market for electric cooking and water heating.

In this connection it is interesting to note that these highly advertised tremendous kilowatt hour consumptions per customer, which advocates of the Government program point to with pride as to what is possible, exist only in places where cheap fuels are not available. They would lead up to believe it was merely the result of cheap rates. Nothing is further from the truth. Ontario, Manitoba, the Pacific Northwest and Sweden have developed tremendous electrical consumption per customer, purely because of the expensive fuel conditions, or subsidized low rates and the government imposed duties on fuels from foreign countries. Those who may be sympathetic with the administration policies should consider Los Angeles, Jamestown or any of a hundred other places which have low electric rates but where reasonably priced gas is available and which have only developed kilowatt-hour consumption per customer below the average, if anything. The forces which bring about these large consumptions are not the ones which might first appear on the surface.

That eventually the economics of the situation will prevail and that these power authority programs have no real benefit to society can be readily shown by the following.

The promise of low electric rates has been offered on the assumption that a tremendous increased consumption will result, which will so reduce distribution costs as to make such rates economic. These theories may be sound in expensive fuel regions. However, the large increased use of electricity is predicated on the use of electricity for cooking and water heating, which, as outlined earlier, in this country is not economic. The reason for this is because, even when neglecting the fact that gas generally involves greater use of labor, the service of cooking and water heating is now supplied to a customer by gas at a considerably lower cost than to do the equivalent work by electricity, even under the Power Authority rates. Proof of this will be found in the following table (Table V) which compares an average home using cooking and water heating served by an existing combination gas and electric service with similar all electric service under the proposed New York Power Authority rates.

TABLE V

Comparison for Equivalent Service—Gas vs. Electricity

| New York Power Authority | | Present Gas & Electric Service | |
|---|---|---|---|
| Lighting ..... | 30 kw-hrs. per month | 30 kw-hrs. per month | |
| Cooking ..... | 125 kw-hrs. per month | 1640 cu. ft. per month | |
| Water Heating .. | 335 kw-hrs. per month | 2700 cu. ft. per month | |
| | 490 kw-hrs. per month | 4340 cu. ft. & 30 kw-hrs. per month | |
| | | 30 kw-hrs. @ 6½c = | $1.90 |
| | | 4340 cu. ft. @ $1.00 = | 4.34 |
| | | | $6.24 |
| 50 kw-hrs. @ 3.5c = | $1.75 | | |
| 50 kw-hrs. @ 1.9c = | .95 | | |
| 100 kw-hrs. @ 1.5c = | 1.50 | | |
| 290 kw-hrs. @ 1.3c = | 3.77 | We pay taxes from above | 1.42 |
| 490 | $7.97 | Net customer cost..... | $4.82 |

Some taxes are assumed to be paid under the Power Authority schedule but we maintain that such rates would not be possible and still pay the taxes we carry.

To assume that a policy which may work out in Canada is wise in this country is an entirely different matter. To assume that an antitoxin for diphtheria would cure hydrophobia would be no more silly.

In fact, in our country, it would seem to be the worst possible thing we could do, when that same energy can be developed more cheaply from coal and supplied to society through a whole chain of labor employing industries, such as the mines, railroads, generating plants, gas plants and the steel and allied industries which supply these industries.

True these administration ventures will give brief and temporary relief through the labor employed in building them. But we must give heed five years, or ten years from now, when these plans become Frankensteins to turn and plague the society that conceived them.

In other words, the administration's program not only will cost the customer more money for a service equipment to that which he now enjoys, but it renders valueless the consumer's present service equipment now in use, and in effect confiscates the investment in gas production and distribution facilities that have been developed to serve the community, plus adding to our unemployment situation.

It may be argued that these points may apply only where gas service is available. How about the territory that does not have any gas service? When it is realized that in this State 91½% of the families already have gas service, the insignificance of this point immediately becomes apparent.

That the fundamentals outlined earlier in this paper, actually work out in practice, it is interesting to note the sluggishness of the electrical development by T. V. A. in far famed Tupelo despite all the costly subsidized ballyhoo to help it.

As near as can be determined T. V. A. activity thus far has only tended to awaken the gas industry in that town to its real strength. They report, in the past year, 101 gas ranges sold as compared to 56 electric ranges in a community that already had 363 gas ranges; and 62 gas water heaters were sold as compared to 18 electric in a community that already had 241 gas water heaters. When the T. V. A. started they claimed 300 gas ranges would be replaced in the first 90 days and the report is that at the end of that time not one had been replaced.

In summary, therefore, it would seem that our industry has a large part to play in the development of sound social economics and it is our duty to develop a consciousness of this fact and to bring all pertinent facts to the attention of the public, so that the program of recovery can be pointed in the right direction and avoid costly pitfalls.

It is our job to hasten the day of a more abundant life and to shed the spotlight of constructive criticism upon the phantom objectives we seem to be chasing.

We should press on in our program of the all gas kitchen, joyful in the knowledge that we are fostering that which is best for society as a whole.

To those of us in the gas industry it cannot help but be inspiring to see how our industry fits into the basic economics of our country, particularly in the future. No man can put his heart into an endeavor in which he does not believe. Such inspiration sooner or later must make itself felt in the progress of the industry, as well as that of the country we are attempting to serve.

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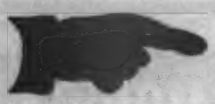

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## Making the Service Application a Record of Importance

*(Continued from page 20)*

another by grouping similar sounding names regardless of variations in spelling caused by transposition of vowels or illegible writing.

3. The entire collection procedure will be simplified, collection cost be reduced, and the percentage of accounts collected will be increased by the selective collection effort which makes it possible to concentrate activity on the particular accounts that require it, and avoid time and expense where it is not needed.
4. Collection effort on final bills will be reduced by the transfer to the new accounts of all amounts due from customers who are merely moving to a new location. The percentage of transfers is usually doubled by the installation of this record.
5. Based on actual experience the charge-off to uncollectible accounts will be reduced.
6. Inactive merchandise balances will be transferred to the new account, and merchandise collection cost will be reduced.
7. The number of security deposits and guarantors will be reduced, as will also the effort required for operating the security deposit and guarantors' records.
8. It will be impossible to charge off an account if a deposit is being carried, or of refunding a deposit if the final bill still remains unpaid: conditions which have been found in other public utility organizations where the record has been installed.
9. The danger of losing or misfiling cards will be eliminated, as the cards are not removed for posting or reference.
10. All remittances received without the cashier's stub being attached will be checked with this record, and the proper account number quickly located.

*(Part 3 in June issue)*

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ECONOMICAL Installation Helps To Sell—Storage Water Heaters
By installing ⅜" Copper Tubing by Hays Copper Plumbing Method in place of ¾" Galvanized Pipe in 37 ft. length from storage to faucet it was possible to deliver hot water at 150° F. for 1,930 cu. ft. of gas per month or at $1.60 per M.C. F. —$3.00. Same installation with ¾" Galvanized Pipe required 2650 cu. ft. of gas at a cost of $4.04. Sell economy and you sell more new heaters.
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5. Every Hays Double Seal Joint is a Union Joint. Easy to break lines.
6. Small amount of water in tubing minimizes heat loss from radiation.
HAYS MANUFACTURING CO. ERIE, PA.

## Consolidated Gas Co., New York, File New House Heating Rate Schedule

A substantial reduction in rates for heating homes by gas was proposed recently, by the Consolidated Gas Company of New York and affiliated gas companies in an application filed with the Public Service Commission.

It is estimated that the reduction in rates will amount to about $311,357.01 for the 3,202 house heating customers now on the lines of the company.

The purpose of the new heating rates is to place automatic heating of homes by gas on a competitive basis with other fuels, the application stated. The radiation charge, which has been a part of the present gas heating rate, is to be eliminated in the new rate schedule.

The simplified and reduced rates proposed in the application are as follows:

First 3,000 cubic feet per month $.115 per hundred cu. ft.

Next 6,000 cubic feet per month $.075 per hundred cu. ft.

Next 6,000 cubic feet per month $.06 per hundred cu. ft.

Over 15,000 cubic feet per month $.05 per hundred cu. ft.

One of the conditions of the new rate is that gas must be used for the entire heating requirements of the customer. The cost of the first 3,000 cubic feet a month is the same as the prevailing domestic rates, and it varies in accordance with the domestic rates in the sections served. For the average customer, the first 3,000 cubic feet is used for cooking and refrigeration. The second block of 6,000 cubic feet covers the use of gas for heating water. When customers use gas for cooking, refrigeration and water heating, and for any other domestic use, the effect of the new rate is to reduce the price of gas actually used for heating the house to six and five cents a hundred cubic feet.

Another condition of the new rate is that the customer's bills must total at least $80.00 for the eight-month heating period from October to May, inclusive.

The variations in the first "step" of 3,000 cubic feet a month, in accordance with the prevailing domestic rates, are as follows:

The first 3,000 cubic feet a month will be $.138 per hundred cubic feet in the territory of the New York and Queens Gas Company; and $.145 in the territory of the Bronx Gas and Electric Company. In Westchester County, the first "step" is divided into two "steps" —the first 100 cubic feet a month, at from $.72 to $.74 a hundred cubic feet, depending on the section of the County, and the next 2,900 cubic feet a month at from $.12 to $.145 per hundred cubic feet. All of the other "steps" in the rate—from 3,000 cubic feet a month and upward—are the same for the entire territory served.

## Index To Advertisers


| | | | |
|---|---|---|---|
| Alpha Lux Co., Inc. | 65 | Lambert Meter Co. | 67 |
| American Gas Products Corp. | 48 | Lattner Mfg. Co., P. M. | 66 |
| American Meter Co. | 10 | Lavino & Co., E. J. | 67 |
| American Stove Co. | 52 | Minneapolis Honeywell Regulator Co. | — |
| Andale Company | 67 | Mohawk Asphalt Heater Co. | 73 |
| Barber Gas Burner Co., The | 61 | Mueller Co. | 4 |
| Bartlett Hayward Co. | 40 | National Tube Co. | — |
| Besse, Osborn & Odell, Inc. | 36 | Patrol Valve Co., The | — |
| Boone County Coal Corp. | — | Phillips, Alfred I. | 62 |
| Byllesby Engineering & Management Corp. | 61 | Pittsburgh Coal Co. | Fourth Cover |
| Cast Iron Pipe Research Ass'n | 6 | Pittsburgh Equitable Meter Co. | 2 |
| Chace Valve Co., W. M. | 63 | Reynolds Gas Regulator Co. | 65 |
| Chaplin-Fulton Mfg. Co. | 67 | Robertshaw Thermostat Co. | — |
| Connelly Iron Sponge & Governor Co. | 61 | Roots-Connersville Blower Corp. | 63 |
| Connersville Blower Co. | 63 | Safety Gas Main Stopper Co. | 57 |
| Cooper Bessemer Corp., The | — | Semet Solvay Engineering Corp. | 57 |
| Cruse Kemper Co. | 65 | Servel, Inc. | 46 |
| Dresser Mfg. Co., S. R. | 75 | Sprague Meter Co. | Front Cover |
| Electrolux Refrigerator Sales Inc. | 46 | Stacey Bros. Gas Construction Co. | 60 |
| Gas Purifying Materials Co. | 63 | Stacey Manufacturing Co., The | 5 |
| Graner Tank & Mfg. Corp. | 63 | Standard Gas Equipment Corp. | — |
| Hays Mfg. Co. | 72 | Superior Meter Co. | 69 |
| Hotel Montclair | 69 | United American Bosch Corp. | — |
| Improved Equipment-Russell Engr. Co. | 73 | United Engineer and Constructors Inc. | — |
| Isbell-Porter Co. | 73 | United States Pipe and Foundry Co. | 9 |
| Johnson Gas Appliance Co. | 62 | West Gas Improvement Co. | — |
| Kitson Co. | — | | |



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## Gas Pressure Controls

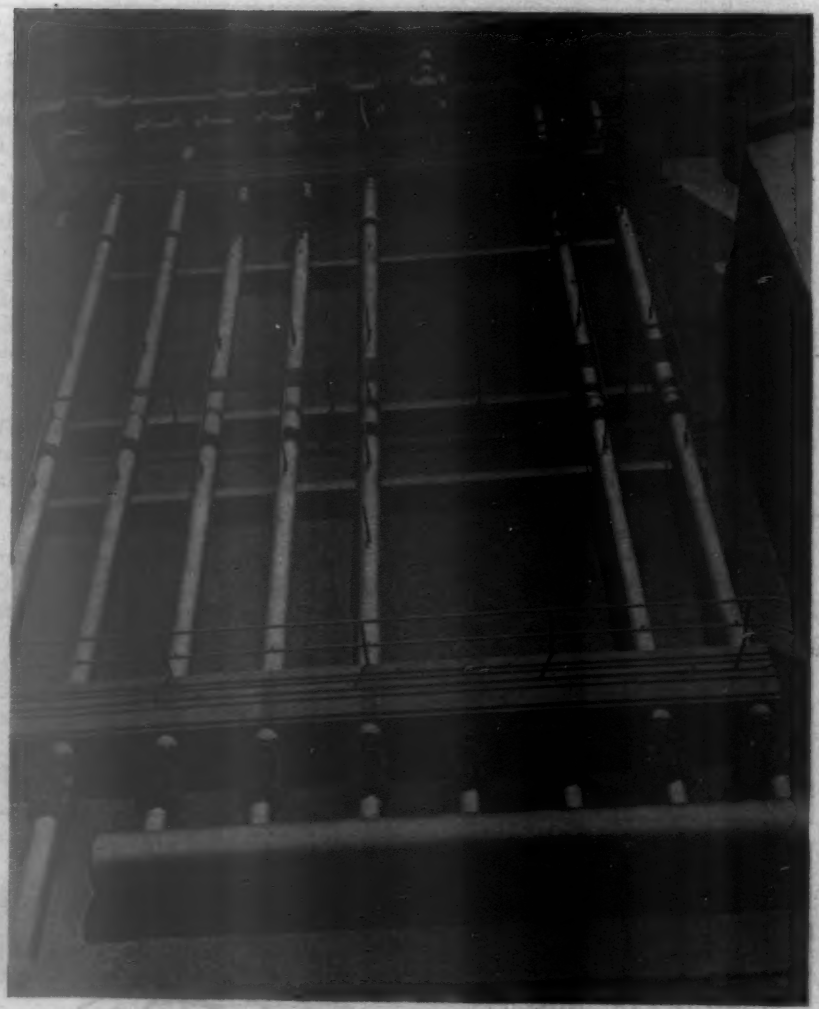
(*Continued from page 16*)

ing between fifteen and twenty miles from the receiver. The maintenance of accuracy and continuous functioning of the gauges at such distances has been a difficult task as the influence of outside factors beyond the control of the gauge user have been numerous. There are but few high pressure distribution systems where unusual demands occur periodically and, therefore, require some devices such as a telemetric gauge. As experience is gained, conditions at the more vital points are usually predictable and provided for in the regular adjustment of controls on practically all systems.

The interconnecting lines between telemetric sending and receiving apparatus are usually leased wires, in most cases property of the telephone companies. Since some types of sending apparatus such as the self sychronized motor and induction balanced types will not operate satisfactorily when the resistance of the wire in a circuit exceeds certain maximum amounts, the total distance and size of the wires of the interconnecting line should be carefully checked. The actual cable distances should be taken rather than air lines distances or the most direct road distances. The telephone companies also limit the voltage which may be imposed upon their cables so that where long distances are involved especially sensitive sending apparatus, such as photo-electric cells or vacuum tubes, may be necessary. When investigating the cost of telephone lines particular care should be given to stating the exact locations, as the cost of a leased line may depend in part only on the actual cable distance. Often particularly difficult installation conditions will be maintained by the telephone company only for higher than average mileage costs. When the cable used must be a submarine cable at one or more points a higher than average cost is charged.

When the utility is a combination of electric and gas it is often possible to arrange for the interconnecting line to be run on existing poles. With certain types of installation care must be taken to guard against induced currents which would cause faulty recording. The wire used is lighter than that ordinarily used for electrical distribution and, therefore, considerable trouble is experienced in maintaining the interconnecting line on poles when not in cable similar to telephone practice.

The high cost of installation and maintenance of telemetric gauges and interconnecting lines requires that the value of such service be high to substantiate investment and maintenance. Such high cost is only justifiable on a system which has a very variable load or the general condition of which has become extremely sensitive due to over loading.



Metering and Regulating Station. More Elaborate Installations Are Required at Metering Stations to Eliminate Turbulence.

Back pressure regulators preserve a predetermined pressure on the inlet to the regulator and allow any excess above that pressure to flow into the outlet. The purpose of such control may be to maintain a uniform and higher pressure on cooling or dehydrating equipment or in storage during off peak periods.

Differential relief regulators may also be termed safety valves, as they open when the differential pressure across any piece of equipment on which they are installed exceeds a predetermined amount. A usual purpose of differential relief regulators is to allow the use of full meter capacity before the governor opens and to by-pass any additional flow, or they may be connected so that the differential pressure across the first of a series of meters is used to actuate the diaphragm and the outlet would be connected to additional meters.

### Location of Control

High pressure storage is seldom installed without some method of control. The value of controls particularly at outlying storage is derived from providing the means with which gas may be received at certain periods and released under conditions when transmitting facilities would not provide the total consumption.

The most difficult locations to select for controls are on systems where sub-transmission mains carry a higher pressure than is desirable on the distribution lines. Each system will provide particular difficulties in this respect and only one generality usually applies which is that as few regulators as possible should be installed initially and others added when conditions warrant.

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### COUPLINGS AND LONG SLEEVES

**STYLE 38 Steel Couplings** make PERMANENTLY TIGHT, flexible connections between plain-end pipe sections, are quickly and easily installed by unskilled labor, are rubber gasketed, and absorb all normal pipe movements. Sizes: ¾" I.D. to largest pipe diameter for all kinds of pipe.

**STYLE 40 Long Sleeves** serve the same purpose as Style 38's, but are installed on widely separated pipe ends. Sizes: ½" I.D. to 24" O.D. inclusive.

**STYLE 53 Cast Couplings** are like Style 38, except cast. Sizes: 4" to 30" inclusive.

**STYLE 65 Compression Couplings** have screw followers instead of bolts to compress the gaskets. Sizes: ¾" I.D. to 2" I.D. incl.

### CLAMPS

Dresser Clamps repair leaks in various types of pipe joints. They can be applied by unskilled labor without interruption of the service, give a permanently tight repair and are made by the world's largest and oldest builder of clamps.

**STYLE 60 Ball Joint Clamps** are adjustable, have a continuous gasket recess, and a sealing "pack" scientifically designed and PROVED. Sizes: 3" to 60" inclusive.

**STYLE 41 (and 4) Collar Clamps** prevent and repair leaks in screw collars (screw couplings). Sizes: ¾" I.D. to 12" I.D. inclusive.

**STYLE 55 Porous Weld Clamps** permanently repair porous but not broken welds. Sizes: 2" O.D. to 26" O.D. inclusive.

### SPLIT REPAIR SLEEVES

Dresser Split Sleeves completely enclose and permanently repair breaks, splits, holes and defective joints of all types. They can be applied quickly, by unskilled labor, in any weather, under water, etc. All are rubber packed. Special styles of welded steel sleeves are built for unusual conditions or odd sizes.

**STYLE 52-A Sleeves** repair welds, screw collars, splits, holes, etc. Inside length: 8". Maximum working pressure: 500 lbs. per sq. in. Sizes: 4" I.D. to 26" O.D. inclusive.

**Style 73 Sleeves** are used for the same purpose as Style 52-A, except maximum working pressure is 250 lbs. per sq. in. Inside length: 8". Sizes: 2" I.D. to 12" I.D. inclusive.

**STYLE 26 Sleeves** repair broken bells on cast iron pipe. Maximum working pressure: 150 lbs. per sq. in. Sizes: 3" to 24" inclusive.

**Style 57 Sleeves** are identical with Style 73, except made for cast iron pipe sizes. Maximum working pressure: 250 lbs. per sq. in. Sizes: 3" to 12" inclusive.

**Multiple Installations** of two or more Style 57 or 73 Split Sleeves, for repairs longer than 8", can be made with simple joiner parts.

**Style 54-A Sleeves** repair leaking joints of the bolted coupling type on steel pipe. Maximum working pressure: 500 lbs. per sq. in. Sizes: 2" I.D. to 26" O.D. inclusive.

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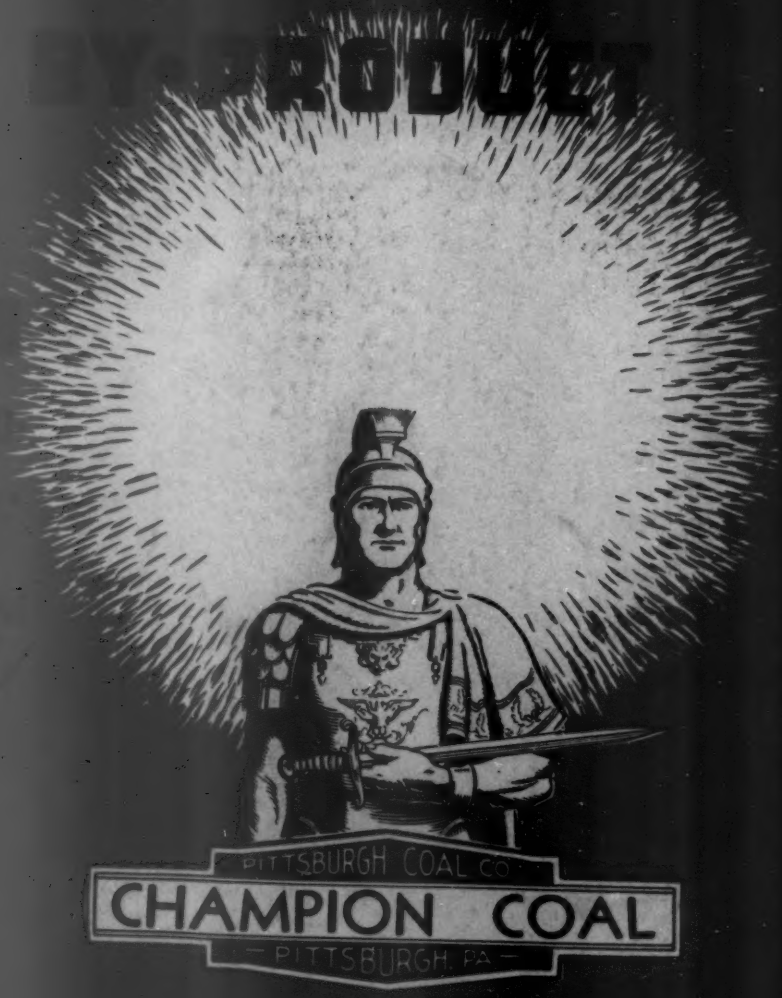
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